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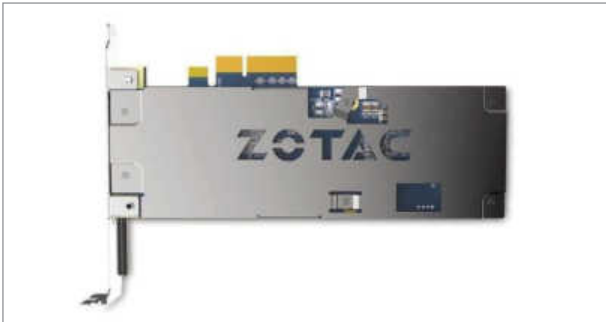
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Zotac Announces SONIX Line Of NVMe PCIe SSDs For Enthusiasts

ZOTAC is launching its first SSD products based on the NVMe PCIe interface. The company says its new SONIX PCIe SSD offers top-of-the-line performance for serious gaming and productivity in comparison with SATA-based SSDs. The SONIX's four express lanes provide sequential read and write speeds of 2,600MBps and 1,300MBps, respectively—up to four times faster than SATA drives. The initial drive in the SONIX line has a capacity of 480GB with 512MB DDR3 cache. It uses a Phison E7 controller and MLC flash memory from Toshiba. Zotac says the drive has built-in technologies such as end-to-end data path protection and dynamic wear leveling to keep data secure and help boost the MTBF to 2 million hours. The company ships the SONIX with both standard mounting brackets as well as low-profile brackets for people building small-form-factor systems. The MSRP for the new SONIX PCIe SSD was not available at press time.

EKWB Introduces Predator 240 AIO Cooler With Quick Disconnects

EK Water Blocks updated its Predator 240 AIO cooler to include quick disconnects (or, in EK parlance, QDC). By adding QDC, EK makes it possible for users to take their existing CPU cooling loop and add in a block for their GPU. This is great for users on a budget who are building a system piecemeal or upgrading over time. For example, you can install your cooling loop now for your CPU, and then when you save up enough to buy that high-end graphics card you've been craving, you can install a waterblock for it and connect it to your existing loop. You won't have to do a complete teardown or stop using existing cooling components. Along with expanding its lineup of Predators with QDC, EKWB also has upgraded all Predators to Revision 1.1, which includes an updated CPU mounting mechanism for the block. The EK-XLC Predator 240 with QDC costs \$219.97.



WATCHING THE CHIPS FALL

Here is the pricing information for various AMD and Intel CPUs.

CPU	Released	Original Price	Last Month's Price	Online Retail Price*
AMD FX-9590 Eight-Core	6/11/2013	N/A	\$239.99	\$239.99
AMD FX-9370 Eight-Core	6/11/2013	\$375	\$199.99	\$199.99
AMD FX-8350 Eight-Core	10/23/2012	\$195	\$179.99	\$169.99
AMD FX-8320 Eight-Core	10/23/2012	\$169	\$144.99	\$139.99
AMD FX-6350 Six-Core	4/30/2013	\$132	\$129.99	\$129.99
AMD A10-7850K Quad-Core	1/14/2014	\$173	\$129.99	\$114.99
AMD A10-7800 Quad-Core	7/2/2014	\$153	\$126.99	\$125.65
AMD A10-7700K Quad-Core	1/14/2014	\$152	\$115.99	\$109.99
AMD A10-6800K Quad-Core	6/4/2013	\$142**	\$131.50	\$137.81
AMD A10-5800K Quad-Core	10/2/2012	\$122**	\$104.99	\$95.99
Intel Core i7- 5960X Eight-Core	8/29/2014	\$999**	\$1,049.99	\$1,049.99
Intel Core i7- 4960X Six-Core	9/3/2013	\$990**	\$1,299.95	\$1,310.64
Intel Core i7- 5930K Six-Core	8/29/2014	\$583**	\$579.99	\$579.99
Intel Core i7- 4930K Six-Core	9/3/2013	\$583**	\$700.00	\$740.32
Intel Core i7- 5820K Six-Core	8/29/2014	\$389**	\$389.99	\$389.99
Intel Core i7-6700K Quad-Core (Skylake)	8/5/2015	\$359**	\$413.99	\$381.99
Intel Core i7-4790K Quad-Core (D.Canyon)	6/25/2014	\$339**	\$339.99	\$339.99
Intel Core i7-4820K Quad-Core	9/3/2013	\$323**	\$390.00	\$444.43
Intel Core i7-4790 Quad-Core (Haswell)	5/11/2014	\$303**	\$309.99	\$309.99
Intel Core i5-6600K Quad-Core (Skylake)	8/5/2015	\$249**	\$259.99	\$249.99

* As of February 2016

** Manufacturer's estimated price per 1,000



GIGABYTE Has News For AMD Fans: The 990FX-GAMING Motherboard

GIGABYTE has two new motherboards for users wanting to build AMD systems. The GIGABYTE GA-990FX-GAMING and GIGABYTE GA-970-GAMING support the latest AM3+/AM3 processors and have all the bells and whistles of the GAMING line of products, including GIGABYTE UEFI DualBIOS technology and Ultra Durable PCIe metal shielding. The GIGABYTE 990FX-GAMING is the higher-end release of the two boards and has an AMD 990FX northbridge and an AMD SB950 southbridge. It supports four DIMMS for dual-channel DDR3 memory up to 2,000MHz and also supports XMP memory. The ATX board is 2-way SLI/Crossfire-ready and has a Killer Gigabit Ethernet controller for smooth online gaming. It has a Realtek ALC1150 codec for up to 7.1-channel HD audio. There is one M.2 and six SATA 6Gbps connectors and one USB Type-C port (back panel). The board retails online for about \$140.

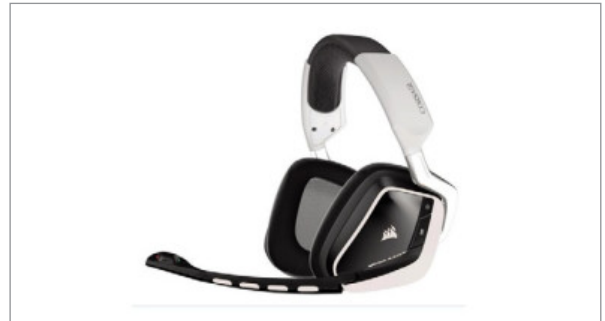


Lian Li PC-M25 Small-Form-Factor Case With Hot-Swap Hard Drive Rack

Lian Li has announced a new case for people building small-form-factor systems. The PC-M25 chassis is built for Mini-ITX and microATX motherboards but has plenty of room inside for enthusiast-level components. The aluminum chassis can fit graphics cards up to 16.1 inches; ATX PSUs up to 9 inches; and CPU coolers up to 3.1 inches, and there are four expansion slots. The PC-M25 can also be loaded with up to seven 3.5-inch hard drives. As many as five of those drives can be placed in a tool-less hot-swap rack, with two more drives fitting into a separate bottom HDD tray. The case comes with two fans: a low-RPM 140mm intake fan that pulls air in through vents on the sides near the front of the case and a 120mm exhaust fan that blows hot air out the back of the top panel. Lian Li says its newest chassis is available in black or silver versions for an MSRP of \$169.

Corsair Introduces White VOID Wireless 7.1 RGB Gaming Headset

Corsair has rolled out a new white version of its most advanced headset, the VOID Wireless 7.1 RGB Gaming. This headset works on the 2.4GHz frequency band and has a wireless range of about 40 feet. Along with Dolby technology and 7.1 surround sound audio, the headset includes RGB lighting that you can sync with other Corsair RGB products using the CUE (Corsair Utility Engine) software package. In conjunction with the new headset release, the company announced it has added a new feature called VOID Visualizer to CUE starting with version 1.15.36. The new software lets owners of VOID headsets and RGB keyboards turn their audio or microphone signals into real-time multicolor graphics displays. The white version of the Corsair VOID Wireless 7.1 RGB headset is available now at retailers and has an MSRP of \$129.99.





EVGA Releases First Graphics Cards Aimed At Virtual Reality Products

There is a wave of virtual reality headgear coming, and most will have significant minimum computing system requirements. To help power those products, EVGA has announced two new “VR-ready” graphics cards. The GeForce GTX 980 Ti VR EDITION card is available in two versions: one with a reference cooler and one with EVGA’s ACX 2.0 cooling package that gives you more headroom for overclocking. Both versions ship with a 5.25-inch drive bay that has front-facing HDMI and USB ports for the new VR headsets. A separate cable will link from the rear of the bay to an internal HDMI outlet on the VR EDITION card. The GeForce GTX 980 Ti VR EDITION card has a base clock of 1,000MHz and a boost clock of 1,076MHz. It has 6GB of GDDR5 memory. The memory clock is 7,010MHz and the total memory bandwidth is 336.5GBps. The card is ready for 2-way/3-way SLI and retails for about \$700 (ACX version).

HARDWARE MOLE



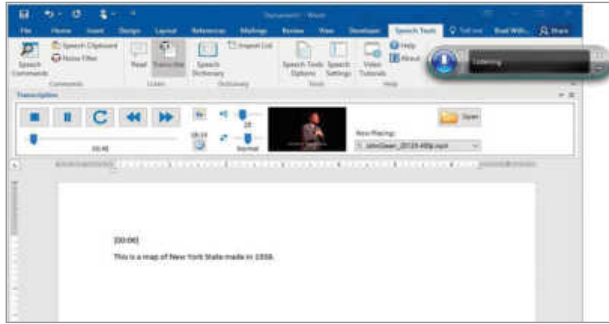
Phanteks Eclipse P400 & P400S

Phanteks says its Eclipse P400 and Eclipse P400S cases are meant for system builders who want to create a clean system with little effort. Both cases have a solid metal exterior with ambient RGB illumination. The midtower P400 comes in black, white, or grey with a side window and measures 18.3 x 8.3 x 18.5 inches (HxWxD). It supports motherboards up to 10.7 inches wide (includes some E-ATX) and graphics cards up to 15.2 inches long. There are two USB 3.0 ports, mic and headphone ports, reset, and LED control on the front. There are seven expansion slots, two 120mm fans (one in front and one in the rear) with room for two more in the front and two in the top. The P400S (pictured above) has all the same specs as the P400 model but comes in both windowed and windowless versions, plus it has a three-speed fan controller.

ASUS Unveils Wireless Repeater

ASUS announced a new wireless repeater that not only has serious tech abilities but also sports a stylish design that will fit right into the decor of a gaming enthusiast. The top-of-the-line ASUS RP-AC68U provides dual-band 802.11ac Wi-Fi that can extend a wireless network at speeds up to 1,900Mbps. The distinct housing features a Myan split-block design, with the valleys in the splits incorporating a rich red background. LEDs on the unit change intensity to indicate signal strength. The RP-AC68U also features five ports in the back for wired Gigabit Ethernet connections. It has one USB 3.0 port that can be used to attach PCs, storage devices, or other products. There are four internal antennas (three transmit and four receive), and the unit operates at 2.4GHz as well as 5GHz. ASUS says the RP-AC68U will be available soon at select retailers.





Tool Adds Dictation, Transcription Features To Microsoft Word

Speech Tools from Dual Writer Software adds a task pane inside the Microsoft Word document window with more than 800 voice commands for tasks such as navigating documents, selecting and editing text, and opening dialog boxes. You can search that command list using voice. The Speech Clipboard lets you save text such as addresses and phone numbers you can enter later using a voice command, while a noise filter reduces extraneous sounds and a read aloud feature helps with document proofing. Plus, you can import vocabulary lists into the Windows custom speech dictionary. Speech Tools' transcription system features a media player with support for most popular audio and video file formats. The media player opens inside Microsoft Word, where you can control it via keyboard shortcuts, mouse clicks, and voice commands. Other useful features include a timestamp button and speed control. You can download a 30-day trial of Speech Tools or purchase the full version for \$29.95 at the Dual Writer website.

Former Mozilla CEO Building New Web Browser

Citing the need to "avert war" between Web users, browsers, and site owners over issues such as advertising and privacy, Brendan Eich, the former Mozilla CEO who also created JavaScript, launched the 0.7 developer version of Brave.

In a post making the announcement, Eich described Brave as "a new browser and a connected private cloud service with anonymous ads." The Brave browser, he said, will block everything, including initial signaling/analytics scripts behind online advertising, impression-tracking pixels, and ad-click confirmation signals.

That means pages will load faster, as Brave notes that as much as 60% of a page's load time is spent loading the underlying technology and 20% of that time is spent loading things that are trying to learn more about you. Brave will

insert ads in a few standard-sized spaces, Eich said. Ads will be "clean" and fund website owners and Brave users, who will be able to spend their funds to go ad-free on their favorite sites, according to the company. By default, the browser won't store any information about you or your data without permission.



SOFTWARE SHORTS

Open-Source Suite Gets Revamped Interface, Greater Interoperability

Since launching in 2011, the LibreOffice suite has been downloaded 120 million times, according to developer The Document Foundation, with customers that include large organizations on every continent. The Document Foundation says the program compares head-to-head with every product in the same category. Version 5.1 of the program is now available, and it has a completely reorganized user interface to provide faster, more convenient access to the most-used features, with new menus in

each application and repositioned icons and menu commands based on user preferences.

The Document Foundation notes that LibreOffice stands apart from competitors by offering superior interoperability; that interoperability has been improved in version 5.1, with greater compatibility with proprietary document formats and filters for Apple Keynote 6, Microsoft Write, and Gnumeric files. Other new features include an improved spreadsheet formula engine and the ability to access files on remote file servers such as SharePoint and Google Drive right from the File menu.





Researchers Hit Milestone In Wireless Transmission Speeds

56Gbps. That's the world's fastest wireless transmission speed, and researchers at Fujitsu and the Tokyo Institute of Technology have reached it. For years, optical fiber networks have been the best option for coping with today's data traffic demands, the researchers note. However, optical fiber isn't always feasible in more urban or remote areas. The new technology developed by Fujitsu and the Tokyo Institute makes it possible to have high-capacity wireless communications equipment installed outdoors in applications where fiber-optic networks would be difficult to deploy. The CMOS wireless transceiver chip the researchers built can process signals at high speeds with little loss across a range of frequencies from 72 to 100 GHz. The CMOS wireless transceiver and wireless module use a low-loss, high-bandwidth transceiver circuit and modularization technology. The initial test achieved data transfer rates of 56Gbps at a somewhat underwhelming distance of 10cm, but Fujitsu expects commercial implementation by 2020.

Facebook Working On New Wireless Network Tech

Pushing ahead with its efforts to bring Internet access to more of the 4 billion people who currently don't have it, Facebook is reportedly working on a new wireless technology that uses the cloud for data management and computation.

The patent application filed by Facebook and engineer Sanjai Kohli describes the wireless network as using packet-switched beams, with the beams formed and switched electronically. The new wireless data network will reuse the same frequency band in all cells, with all frequency channels available to every node in the network and channels being dynamically assigned by the



cloud to maximize network capacity. Rather than focusing on just one particular link, the patent application notes, this new system will dynamically adjust route and frequency channel assignments, transmit power, modulation, coding, and symbol rate to maximize

network capacity and the probability of packet delivery. The technology is in line with the work being done by Facebook's Connectivity Lab in conjunction with Internet.org to use a variety of methods, including drones, satellites, and lasers, to bring the Internet to everyone. No word on when we can expect formal testing of the new technology.

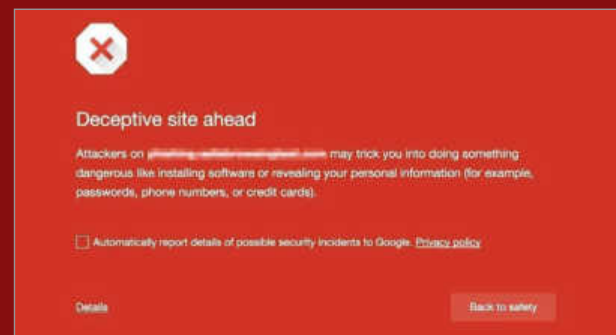
SITE SEEING

Google Expands Safe Browsing To Deceptive Links & Buttons

We've all run into various forms of social engineering attacks when browsing the Web—links that try to trick you into downloading malicious software or images that warn something is wrong with your system, for example. Google's Safe Browsing technology has been expanded to protect you from just such things and other embedded content such as social engineering ads.

Google first announced Safe Browsing would protect from social engineering attacks last November and, in a blog post announcing these latest additions, the company notes its fight against unwanted software and social engineering is just beginning and that it will continue to improve Safe Browsing protection.

Google considers embedded content on a website to be social engineering when that content either pretends to act, look, or feel like a trusted entity or tries to trick users into doing something they would only do for a trusted entity (sharing passwords, for example).





Job Of The Month

The land of blue football fields and potatoes is also the home turf for Micron, a NASDAQ 100 company that is one of the world's largest producers of DRAM. Micron is a technology giant and has an opening for an enterprise data scientist at its Boise, Idaho, headquarters. Applicants should be people who "think in algorithms" and who are "comfortable working with one hand on a whiteboard and the other on a keyboard." This person will work with a team of engineers and IT experts to uncover patterns in data that lead to innovative types of business intelligence solutions. You'll work on projects across company silos (sales/IT/finance/marketing/yada yada) and should be ready to make presentations to the corporation's top wonks. You need to have at least five years of experience in stats, data science, and analytics; know your way around R, SAS, SPSS, and related stat programs; and have a broad and intuitive understanding of data science and machine learning. Interested? Man (or woman) up, and head for Idaho.

Source: jobs.micron.com

Anybody Out There Know How To Code?

You never know for sure why someone is searching for a particular term on the Internet (and sometimes you may not want to know), but it's always interesting to peruse the end-of-year "top searches" lists compiled by the major search engines. One of Google's lists, for example, shows the top software technologies people searched for during 2015. Although some people may have just run across an unfamiliar term or wanted to know more about a certain language or technology, we're guessing a lot of those searches were by people in the industry looking for a little coding help. We all get by with a little help from our friends.

Source: Google

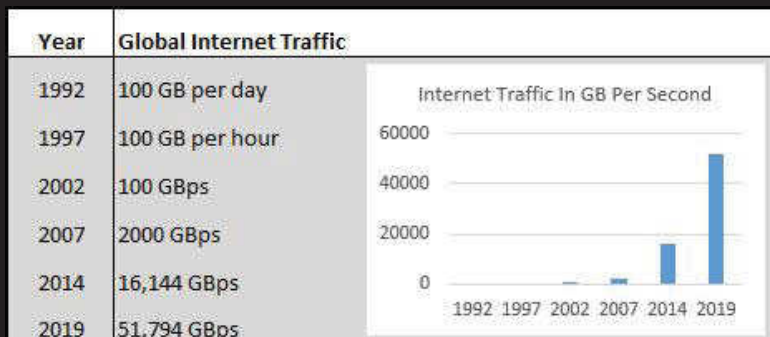
Top 10 Software Technologies Searched For On Google In 2015

1. Java
2. HTML
3. Python
4. JavaScript
5. SQL
6. CSS
7. Adobe Flash
8. R
9. C
10. Go



Not Enough Hours (Or Seconds) In A Day

The amount of data going through the old Intertubes continues to skyrocket, but percentage-wise, the growth rate is finally starting to slow down. Back in the early days of the Internet, traffic could be measured in tens of gigabytes per day. Now it's measured in tens of thousands of gigabytes per second. According to data compiled by Cisco Systems for its Global IP Traffic Forecast, traffic on the Internet grew five-fold in the past five years but is projected to grow only three-fold between 2014 and 2019.



Source:
Cisco

RAW Numbers:

1

Number of zettabytes of data that will move over the Internet annually by the end of this year. This number will increase to 2 zettabytes by the end of 2019. (A zettabyte equals a thousand exabytes or a thousand billion gigabytes.) For more info on the growth rate of data on the Internet, see "Not Enough Hours (Or Seconds) In A Day" in the column at left.

Cisco

15

Percentage of adults in the United States who have used online dating sites or apps. This includes 27% of young adults ages 18 to 24 and 12% of older adults ages 55 to 64.

Pew Research

43

Percentage of millennials in the United States who consider social media an important part of their skillset at work. About 37% of Generation Xers agree, but only 20% of boomers feel that way.

CompTIA

12 million

Number of smart watches that Apple shipped during 2015. This represented about two-thirds of all smart watch shipments made during the year.

Canalys

129 million

Number of autonomous (self-driving) vehicles forecast to be sold between 2020 and 2035.

Navigant Research



Make It Yours.

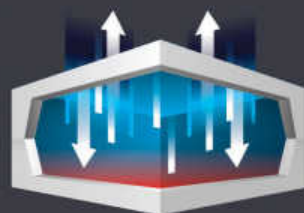


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3D Vapor Chamber

Vapor Chambers are merged together with native heatpipes, maximizing heat transfer compared to conventional methods.

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coolermaster.com/MasterAirMaker8

Available At: amazon.com



The Perfect Storm

MSI's Vortex Is As Powerful As It Is Stunning

If you're here looking for a small form factor PC that plays by the rules, you've come to the wrong place. Oh sure, there's nothing inherently wrong with traditional SFF cases, but when was the last time "traditional" excited anyone? We know what a box looks like, and, by and large, what we can put in it. There are rules.

MSI's Vortex isn't terribly fond of the rules. On the outside, it's a sleek and stylish small form factor PC. At a mere 10.5 inches tall and a total volume of 6.5L, though, it doesn't seem like much room for components that are even remotely powerful.

What we're really talking about is more than a shrunk-down, cool-looking computer. We're talking about changing the way we think about SFF PCs. Beneath its unique exterior is an outrageous number of cutting-edge parts.

"Our goal in designing the Vortex was to create a radical design that would push the limits of small form factor desktop gaming without sacrificing desktop gaming performance," says Vincent Chen, associate marketing manager at MSI.

Starting a revolution like this wasn't easy according to Chen. He says MSI's design team created "countless" revisions before finally deciding on the sweet little system you see before you. "Initially, the Vortex took on a more literal design, with a spiral-like exhaust, and evolved to a much more sleek and clean design.

"Trying to fit all that hardware in such a small space was no easy feat. We had to utilize cutting-edge

hardware technology from both desktop components and mobile components."

Big Power In Small Spaces

Consider your own wish list for a high-end build. You're likely looking for a CPU with an unlocked multiplier, a respectable graphics card (or more, if you have the cash), a smokin' solid-state drive to keep the system fast on its feet, and a mass storage drive for all your files. The Vortex checks all those boxes, and then some.



Let's start with the processor, where MSI gives you a choice between three of Intel's best quad-core Skylake processors. At the top of the stack is the Core i7-6700K, arguably our favorite overclocker of the family. The 6700K motors along at a crisp 4GHz, and it can bounce up to 4.2GHz as loads dictate. With four physical cores and Hyper-Threading, the 6700K can handle multi-threaded workloads like a boss.

You also have the option of Intel's Core i5-6600K. It's a salty CPU, too, with the same four physical cores and unlocked multiplier as the 6700K; the key distinction is that the 6600K doesn't have Hyper-Threading, so if that's more important to you than having an unlocked multiplier for overclocking, you might want to consider the Vortex's third option: an Intel Core i7-6700. The standard 6700 has lower base and Turbo clocks than the 6700K (3.4GHz and 4GHz vs. 4GHz and 4.2GHz, respectively). The tradeoff is the 6700's 65W TDP, which is almost 30% lower than the 6700K's 91W.

"We could have utilized a mobile processor to save more space and power," Chen says, "however, it was still viable to push performance further and integrate a socketable desktop CPU for more extreme performance and upgradeability. It all worked out perfectly."

Regardless of the processor you pick, you'll be able to support the latest and greatest complementary hardware. The Vortex has either 16GB or 32GB of DDR4-2133 by default, but it supports up to 64GB. (Be sure you use SO-DIMM modules.) The Z170 chipset offers plenty

Advertisement



The exploded view of MSI's Vortex will blow your mind. Somehow, MSI's engineering heroes were able to design a small form factor PC that can include an Intel Core i7-6700K CPU and two NVIDIA GeForce GTX 980 MXM graphics cards. Also tucked inside the Vortex are two PCIe 3.0 NVMe M.2 solid-state drives configured with MSI's Super RAID 4 technology, a 1TB hard drive, Killer networking controllers, and an innovative cooling system that makes it possible to put all this in a 6.5L chassis.

of PCIe 3.0 lanes, the best bus for the new crop of SSDs to hop aboard.

The Vortex's graphics subsystem is equally impressive, if not more so. The reason? MSI manages to include not one, but two elite NVIDIA GeForce graphics cards inside the system. Like you do with the CPU, you get a choice—a pair of GTX 980s or GTX 960s. Note that these are MXM cards, so they're not quite as potent as their desktop counterparts, but it's close. For example, the MXM GTX 980 has the same number of CUDA cores as the desktop GTX 980, as well as the same GDDR5 memory bandwidth. Each GTX 980 in the Vortex has an 8GB frame buffer, while the GTX 960s each have 3GB. Working together in SLI, it's easy to see why MSI's internal testing of the Vortex revealed that the mighty mini delivers graphics performance on par with PCs that are much larger.

Good things continue to come in pairs when we move to the Vortex's storage drives. Solid-state drives that use a combination of PCIe 3.0 and NVMe are at the top of the food chain, so MSI bestows the Vortex with two of 'em. Then, the PCIe SSDs inside the Vortex receive the Super RAID 4 treatment, a technology exclusive to MSI. According to the company, Super RAID 4 is capable of yielding a maximum throughput of up to 3,300MBps, so you can expect the Vortex to move at a very brisk pace.

Cool Operator

A quad-core processor and two graphics cards tend to turn up the heat, which can be a dangerous proposition for SFF PCs—especially one as small as the Vortex. MSI's engineers rose to the challenge and outfitted the Vortex with

a cooling system that thumbs its nose at conventional wisdom.

MSI Storm Cooling Technology works by creating a rotating column of airflow that swirls through the system. It pulls cool air in through the bottom of the chassis and blasts hotter ambient air out through the top of the case. According to MSI, Storm Cooling Technology is extremely efficient.

"We needed to create a cooling solution that could efficiently cool a system of this size and power while still maintaining a relatively low volume for the fan," Chen explains. "Since the Vortex is a cylindrical design, it made sense to use only a large single-fan solution so it would require less power yet still keep the system cool and stable even in extreme gaming scenarios. The single fan located at the top of the

Vortex would draw in all the air from the bottom of the system and pull it throughout the core, circulating air throughout and expelling the heat through the top exhaust. It's a very unique design."

Incredibly, the Vortex is able to keep its components cool without sounding like a jet engine. MSI reports that the Vortex produces less than 22dB of noise at idle, and while running basic tasks (Office, web browsing, etc.) the system is scarcely louder, at less than 28dB. Even when the Vortex is running at full throttle, MSI says it will remain below 37dB.

Gold, Standard

MSI saved some ingenuity for the Vortex's power supply. Inside, the system boasts an 80 PLUS Gold-certified PSU capable of doling out 450 watts of juice to the components. The best part about the power supply is that it's installed within the Vortex. Unlike a mini PC, there's no external power brick to worry about.

"During the design process, we did make changes in order to fit the PSU inside the unit," Chen says, "because no one wants to lug around a giant power brick."

Supercharged Networking

The Killer brand has been at the forefront of networking for power users for many years, and the chips found within the Vortex work together to give gamers a comprehensive system that puts the important web traffic (as in, games) first. The genius that calls the shots is Killer's DoubleShot-X3 Pro.

Killer DoubleShot-X3 Pro, takes advantage of the Vortex's three networking pipelines by prioritizing the packets from your game and funneling the rest elsewhere. Important, real-time traffic goes through one of the Vortex's two Killer E2400 Gigabit Ethernet controllers, while the second E2400 handles the medium-priority stuff, such as Twitch streams and YouTube videos. Finally, everything else (file downloads,

Windows updates, etc.) travels over the Vortex's integrated Killer Wireless-AC 1535 wireless adapter. This 802.11ac module is particularly advanced, since it supports MU-MIMO (Multiuser MIMO), which improves throughput while simultaneously decreasing latency.

The Vortex also has an ace up its . . . cylinder: the all-new Killer Shield K9000. This nifty devil is a digital LAN transformer; what you need to know is that it's capable of lowering latency while gaming. It should also reduce jitter.

Here Be Dragon

The Vortex's hardware lineup is stacked with talent from top to bottom, but MSI has software at its disposal that will let you push the system's components even more. For those who are unfamiliar, allow us to introduce MSI's Dragon Center.

Dragon Center gives power users a tremendous amount of control over the Vortex. Overclockers can use it to fine-tune frequencies in order to squeeze additional performance out of their hardware. The System Monitor gives users an at-a-glance view of the PC's vitals, including CPU and memory utilization, fan speeds, power consumption, and more. The LED Wizard takes control of the Vortex's LEDs (obviously), giving you the ability to set a custom color for the light as well as pick from a nice list of lighting effects.

"Enthusiasts can even easily access their system information via their mobile phone with the Dragon Center App that is available for Android and iOS devices," Chen adds.

Monsoon Season

In addition to all this power, the Vortex has the enough display outputs to run 4K video to as many as six displays.

TEMPEST IN A TEAPOT

Specifications	MSI Vortex
Available CPU	Intel Core i7-6700K Intel Core i7-6700 Intel Core i5-6600K
Chipset	Intel Z170
Memory options	32GB DDR4-2133 16GB DDR4-2133
Max memory	Up to 64GB DDR4-2133
Available GPU	NVIDIA GeForce GTX 980 SLI NVIDIA GeForce GTX 960 SLI
Storage	2 x PCIe 3.0 x4 M.2 128GB SSD (NVMe) 1 x 2.5-inch 6Gbps SATA HDD
Wireless communication	Killer WIFI 802.11ac 2x2, Bluetooth 4.1
Rear I/O	4 x USB 3.0 (Type-A) 2 x Thunderbolt 3/USB 3.1 (Type-C) 2 x HDMI 2 x Mini DisplayPort 2 x Gigabit Ethernet (Killer) 1 x S/PDIF out Audio I/O
PSU	Embedded 450W 80 PLUS Gold-certified

With all this in mind, it's safe to say there's very little the Vortex can't handle.

At the time of this writing, MSI was prepping two versions of the Vortex for a March 16th launch. The flagship model includes two GeForce GTX 980 GPUs and 32GB of DDR4-2133 will carry a price tag of \$3,999.99. If you opt for the Vortex with dual GTX 960s, you'll get 16GB of DDR4-2133; this system's MSRP is \$2,199.99.

Whichever Vortex you choose, it's plain to see that you'll have a capable rig right out of the box (just add keyboard, mouse, and monitor). For your next system, defy expectations: Go big by going small. ■



"Software snags aside, the Viper V760 is a terrific mechanical keyboard that doesn't have a stratospheric price tag."

Viper V760

\$109.99

Patriot

www.patriotmemory.com

Patriot Viper V760

Patriot has been producing enthusiast-grade memory for decades, and the company has naturally become pretty good at it. Over the years, Patriot's shown a knack for making other high-end PC hardware, too, as its fleet of enthusiast gear has steadily grown. Now, with the Viper Gaming trio, gamers have even more firepower at their fingertips, particularly with the Viper V760 mechanical keyboard.

With so many mechanical keyboards on the market, you could say that the Viper V760 is rather late to the party, but this keyboard certainly knows how to make an entrance. The keyboard's LED lighting is among the best we've ever experienced. In addition to per-key customizable backlighting, the Viper V760 has an astounding 11 available lighting modes. Many of the modes are further adjustable, as well (such as changing the speed of the effect). If you're an enthusiast who likes pretty, eye-catching hardware, the Viper V760 looks mighty tough to upstage.

Naturally, though, there's more to the V760 than simple good looks. From ESC to the numpad's ENTER key, the V760 uses Kailh Brown mechanical keyswitches. For

the uninitiated, Brown mechanical switches are both tactile and non-clicky, meaning they provide a slight "bump" but no audible report, respectively, when the switch actuates. This combination makes them a good "compromise candidate," if you will, providing a solid typing/gaming experience without assaulting your co-workers' or clanmates' ears. Personally, I thought the V760's switches felt great in use, but that comes with the standard mechanical switch disclaimer: The set of fingers I used to test the V760 is the only set I've ever used and will ever use. You may prefer Blue or Black mechanical switches, and that's OK. Just know that if Brown switches are your jam the Viper V760 is quite good.

Elsewhere, the fit and finish of the V760 give the impression that Patriot has been producing gaming peripherals for years; for a first effort, this keyboard is extremely impressive. Take the V760's wrist rest (an afterthought with a lot of keyboards), for example. The surface is essentially the same soft-touch rubberized coating you'll find on many PC cases, which gives it a touch of class, but that's not even the best part. The wrist rest magnetically attaches to the

keyboard, a substantial improvement over the cheap plastic-on-plastic connections (that always feel like they're an awkward twist away from breaking) most keyboards use. I liked the V760's aluminum chassis, too. In addition to giving the keyboard a refined look, the aluminum does a nice job reflecting the V760's LED lighting.

The Viper V760's customization software provides an extensive number of options and is easy to use, but it's not without a few quirks. When I used the software to update the V760's firmware, it rendered much of the keyboard useless. Fortunately, I was able to reset the keyboard to factory state, and Patriot tells me a fix is in the works. In the meantime, the best way to restore the Viper V760 to full functionality is to press and hold the Viper (Function) key and Pause/Break key together for 10 seconds.

Software snags aside, the Viper V760 is a terrific mechanical keyboard that doesn't have a stratospheric price tag. Put it in your arsenal and take down the competition. ■

BY VINCE COGLEY

Specs: Switch type: Kailh Brown mechanical; 50 million keystroke life span; Interface: USB; Per-key RGB backlighting (11 lighting modes); 14 light control keys; 104-key rollover; Macros: Yes (5 profiles); USB pass-through port; Game mode; Warranty: 2-year limited

"... anyone who plays games that involve a lot of frenetic clicking should find the XM300 to be a capable performer."



GIGABYTE XM300

When you think about GIGABYTE, you think about motherboards. You think about graphics cards. It's possible you even think about the company's BRIX mini PCs or its laptops. But gaming peripherals? *Naw*, you think, *that's what other hardware manufacturers do.*

Well, think again.

As it turns out, GIGABYTE's existing stable of peripherals is fairly substantial, and the XM300 happens to be the first mouse in the company's recently launched XTREME GAMING series. Gamers looking to replace an old mouse or upgrade from a general-purpose mouse can't have enough options, and the XM300 is certainly worth a closer look.

GIGABYTE positions the XM300 as a solid, jack-of-all-trades option for gamers of any grip style, whether that's

palm, claw, or fingertip. That's not an outlandish assertion, particularly because the main left and right mouse buttons are fairly responsive regardless of where they're pressed. (Claw and fingertip grips, for example, will wind up making contact further back on the main mouse buttons, for example.) Personally, though, I was most comfortable—by a wide margin, in fact—using the XM300 with a palm grip; because of the mouse's 5.1-inch length, I found it easier to maneuver using such a grip. Your mileage may vary.

Internally, the XM300 has the composition you'd expect from a gaming mouse of its caliber. Its optical sensor (a Pixart 3988) has a user-configurable resolution that ranges from 50 to 6,400dpi. The main mouse buttons use Omron switches that have a rated life span

of 20 million clicks. Other vitals include an adjustable polling rate (125Hz to 1,000Hz), a maximum acceleration of 50g, and a maximum tracking speed of 200 inches per second.

Like most gaming mice, the XM300 relies on a downloadable utility to manage a lot of its settings. GIGABYTE calls its software Xtreme Macro Engine, but it does quite a bit more than create and manage macros for the XM300. You can reconfigure what every button does, change DPI presets and polling rate, and customize the mouse's main LED lighting. The software is effortless to use and only requires a modest amount of RAM (it used just under 32MB on our test system).

Using the XM300 was a mostly positive experience. As mentioned, the mouse's body and its long main buttons really make it ideal for palm grip gamers, and the XM300 was very comfortable when I used it as such. The main buttons were crisp and fast during in-game action, and anyone who plays games that involve a lot of frenetic clicking should find the XM300 to be a capable performer. The mouse's two thumb buttons were positioned perfectly for my hand, as well. The large Teflon feet (GIGABYTE also includes a set of replacement feet for when you grind original set down to nothing) do help the XM300 glide across a mousepad, but I couldn't help but feel that the mouse itself is a little light (weighing 3.56 ounces) for its size. All in all, though, I'd gladly take the XM300 into battle again.

With an inviting price, the XM300 is what I'd call a meat-and-potatoes gaming mouse. The XM300 goes to work and does its job admirably. That's all I need. ■

BY VINCE COGLEY

XM300
\$49.99
GIGABYTE
www.gigabyte.us

Specs: Sensor: Optical (50 to 6,400dpi); Body Type: Right-handed; LEDs: Yes (16.8 million colors, 3 effects); 8 programmable buttons; Macros: Yes (up to 50); Onboard Memory: Yes; Weight: 3.56oz.; Interface: gold-plated USB; Cable length: 5.9ft.

**Gamer Storm Genome**

\$249.99

Deepcool

www.deepcool.com

"... adding this custom-looking reservoir to a front panel that is already very attractive is a design home run."

Deepcool Gamer Storm Genome

One of the first things many of us look at when considering the purchase of a new case is whether it will accommodate the cooling subsystem that we'd like to install in our next build. Can you install big enough radiators? Is there room in the main interior space for the reservoir and pump that you have your eye on? How will it look when everything is put together? And so on.

In this regard—as well as in a few others—Deepcool's Gamer Storm-branded Genome certainly has a leg up on the competition, as it comes with everything you need to cool your CPU pre-installed right out of the box. The case comes with Deepcool's Captain 360 all-in-one CPU cooler, so there's a 360mm triple rad installed beneath the top panel complete with three 120mm fans, and the CPU pump and waterblock assembly is in place and ready to attach to your CPU. In addition, there's a very cool twist: Deepcool built a clear, cylindrical double-helix reservoir into the front panel, so not only does this case keep your CPU nice and cool, but it also has a great custom look.

Our review unit was the white variant, which comes with a blue helix reservoir, but you can also get the Genome in black with either a red or green reservoir. There's no wrong answer here; the translucent tubing on the Captain CPU cooler's pump/waterblock unit matches the color of the reservoir installed in the case, making it easy to put together a build with a uniform color scheme.

More good news: The Genome's list of cool touches doesn't end with its pre-installed CPU cooler. The case also provides a great-looking PSU shroud that conceals wiring but still lets you show off a bit of your PSU. On top of this shroud is a vertical slot with a corresponding external slot cover that you can use to mount a graphics card vertically, so that the front of the card faces out through the Genome's window panel instead of straight down. The case doesn't come with the PCIe extender that you need to pull this off, which is a little disappointing, but we love the fact that the case allows for vertical GPU mounting, and an extension cable shouldn't set you back much more than six or seven bucks.

In addition, the Genome smartly follows the newest case trend in taking all of its 3.5-inch and 2.5-inch drive bays out of the visible space in front of the motherboard tray and moving them behind the right-side panel. There's a two-bay drive cage for 3.5-inch drives beneath the PSU shroud near the front panel, and there are four 2.5-inch vertical mounts on the back of the motherboard tray for SSDs, so the Genome helps minimize the amount of work you'll need to do to manage your system's power cables.

The Genome's all-steel interior matches its external finish and looks fantastic. The inwardly slanting lattice that acts as the front of the interior allows for good-sized graphics cards as-is, but in the event that you load up with one (or two) that requires a little more elbow room, the lattice includes an easily removable window that extends GPU support up to nearly 13 inches.

Deepcool's Gamer Storm Genome has an MSRP of about \$250, which seems a little high until you remember that in addition to a solidly built mid-tower PC case, you're also getting a CPU liquid-cooling setup with a 360mm radiator and a reservoir built into its front panel. And speaking of the double-helix reservoir, we have to say once again that adding this custom-looking reservoir to a front panel that is already very attractive is a design home run. When it's turned on and lit up, the Genome looks like some alien artifact of immense power. And who doesn't want one of those? ■

BY CHRIS TRUMBLE

Specs: Dimensions: 19.9 x 8.3 x 20 inches (HxWxD); Materials: SGCC steel, ABS plastic; Motherboard support: Mini-ITX, mATX, ATX; Drive bays: 2 x 3.5-inch internal, 4 x 2.5-inch internal; Fans (included): 1 x 120mm rear, 3 x 120mm top (radiator); Fans (optional): 2 x 120mm front, 2 x 140/3 x 120mm top; Ports: 2 x USB 3.0, audio I/O



"... if you need an affordable case that accommodates lots of storage, has good ventilation, and is easy to build in, the Stealth might just be your huckleberry."

Stealth
\$69.99
Rosewill
www.rosewill.com

Rosewill Stealth

One thing that we know from spending lots of time at LAN parties and talking to modders and DIY PC builders everywhere: Where PC cases are concerned, one size does *not* fit all. Certainly there are popular trends in case design, just like in any other product market, and the other Rosewill case we review in this issue (the Gungnir) is a great example of how to build a budget case and still include many of the hottest features available today.

The Rosewill Stealth, on the other hand, is a little bit of a throwback, especially where its storage capabilities are concerned. As we have seen in lots of cases lately, the move to clear all the internal drive bays out of the main space in a case's interior (which we heartily approve of, by the way), often does so at the expense of having lots of bays, as there's considerably less room behind the motherboard tray for stacking large numbers of hard drives

and/or SSDs than there is just inside the left-side panel.

Rosewill knows this, and also knows that there are still builders out there who want to really beef up their PCs' storage capabilities. To that end, the Stealth doesn't push its drive bays out of sight—in fact, it doubles down on them. The Stealth has three 5.25-inch external drive bays, one of which you can easily convert to a 3.5-inch bay, and no less than *eight* internal 3.5-/2.5-inch drive bays stacked below them. The hard drive/SSD bays are all equipped with plastic slide-out trays that are easy to move in and out once your drives are attached to them with standard mounting screws, and the 5.25-inch bays above use spring-loaded locking clips for completely tool-less installation and removal.

The Stealth also has a recessed external hard drive dock near the front of the top panel in between its two fan speed control buttons; yes, this case can handle your storage needs.

Other amenities onboard the Stealth include no fewer than four removable dust filters, generous rubber-grommited cable management holes in the motherboard tray with corresponding tie-down anchor spots, a spacious PSU bay with insulation pads to minimize vibration, four pre-installed fans and mounts for two more, a windowed side panel, and thumbscrew-equipped expansion slot covers. There's also a motherboard tray cutout for mounting a CPU cooler, wide plastic feet with rubber insulation pads, and the aforementioned fan control speed buttons.

You get all of this stuff for less than \$70, so if you need an affordable case that accommodates lots of storage, has good ventilation, and is easy to build in, the Stealth might just be your huckleberry. ■

BY CHRIS TRUMBLE

Specs: Dimensions: 19.7 x 8.3 x 19.7 inches (HxWxD); Materials: SECC steel, plastic; Motherboard support: Mini-ITX, mATX, ATX; Drive bays: 3 x 5.25-inch external (one can convert to 3.5-inch), 8 x 3.5-/2.5-inch internal; Fans (included): 2 x 120mm LED front, 1 x 120mm top, 1 x 120mm LED rear; Fans (optional): 1 x 120mm top, 1 x 120mm bottom; Ports: 2 x USB 3.0, 2 x 1 x USB 2.0, audio I/O



"Patriot's V360 gaming headset has a handful of features you'd expect to find on much more expensive units . . ."

Viper V360

\$69.99

Patriot

www.patriotmemory.com

Patriot Viper V360

Patriot's foray into gaming headsets comes to us as the Viper V360, a red and black-themed unit that looks like a close relative of the Patriot Viper V560 Gaming Mouse. This headset has a similar matte black finish with a rubberized texture to it. There is a Viper logo on each of the cans, and a glossy black metal mesh grille covers an LED-lit panel on each ear cup. A thin lightweight headband adjusts to fit your head and a pair of rigid plastic bands connect the cups and keep the unit properly seated on your head where it belongs.

The ear cups are lined with soft, breathable foam covered in black fabric mesh. The ear cushions are rectangular and enveloped most of this reviewer's ears, making the headset comfortable to wear for hours on end. The fabric ear covers don't isolate sound as well as a nonporous material would, but what you lose in noise isolation, you gain in

comfort. Another really nice feature is the foldable mic boom, which becomes nearly invisible when you don't need it, and flips down when you do.

The omnidirectional mic has a 100Hz to 10kHz frequency response, 60dB SNR, and a 44dB (+/- 3dB) sensitivity. There are a pair of drivers in each can, with a large 40mm neodymium magnet driver acting as the mid-range and high-frequency speaker. The other driver is a smaller 30mm unit, which handles the low-frequency sounds in each can. Patriot's UBR (Ultra Bass Response) switch lets you enable/disable these drivers, but it's hard to imagine a situation where someone would want to turn them off. It added something to just about every situation, such as an extra punch to bullets in shooters, a growl to the engines in racing games, a percussive emphasis to music, and an extra oomph that makes action

movies more immersive. Despite the number of discrete drivers, this headset offers virtual 7.1 surround sound, which was particularly effective in FPSes like *Dying Light* and *Star Wars: Battlefront*.

The UBR switch resides on the left can, along with a volume dial and a switch for enabling/disabling the LED panels. Each can also has a clearly marked R and L to help ensure you put the headset on correctly every time. Patriot also backs the Viper V360 with a two-year warranty.

Patriot's V360 gaming headset has a handful of features you'd expect to find on much more expensive units, it's comfortable to wear for extended periods, and it looks sharp enough to show off at the LAN party. If you're in the market for a gaming headset, this one needs to be on your short list. ■

BY ANDREW LEIBMAN

Specs: Drivers: 40mm neodymium main driver, 30mm sub driver, 20Hz to 20kHz; Impedance: 32 ohm @ 1kHz; Sensitivity: 105dB +/- 3dB @ 1kHz; Mic: 100Hz to 10kHz; Sensitivity: -44dB +/- 3dB Controller: on-can volume, red LED on/off, and UBR switch; Connector: gold-plated USB; Extras: Ultra Bass Response switch, 7-foot braided nylon cable



"Rosewill is increasingly offering enthusiast-grade products at bargain prices, and that's a win for enthusiasts, on a budget or otherwise."

Gungnir
\$64.99
Rosewill
www.rosewill.com

Rosewill Gungnir

We recently reviewed Rosewill's Stryker M, a budget case with a surprisingly refined set of features. For \$59.99, it comes with two front-mounted LED fans, removable dust filters on top and at the bottom, a windowed side panel, SSD mounts on the back of the motherboard tray, and more. Next up, Rosewill sent us its new Gungnir case, and we have to say that we're even more impressed.

The Gungnir (its name comes from the legendary spear of the Norse god Odin) costs five bucks more than the Stryker M, and has all of the stuff you get with that case (minus the captive side-panel thumbscrews, for some reason). In addition, Rosewill gives the Gungnir a more elaborate front panel, with a high-gloss inset with red accents, and adds a third removable dust filter behind that front panel. The case also adds more USB ports up at the front of the top panel (two USB 2.0 ports), as well as a fan speed control button that controls all three pre-installed fans plus three more.

Inside, the surprises keep coming, as Rosewill adopts the latest interior design trends for the Gungnir. For starters, the case has a PSU shroud that provides enough space for a massive PSU, which not only gives the interior a cleaner look, but also makes cable management much easier. And speaking of cable management, instead of including a series of cable management slots along the edges of the motherboard tray for running necessary power cables in from behind, the Gungnir staggers motherboard tray and the interior panel that runs vertically along the front of the case just enough that you can easily bring cables in between them from behind. (There is one rubber-grommeted cable aperture on the top of the PSU shroud.) There are several twist-tie anchor points along both surfaces so that you can keep things tidy.

Moving the obligatory cage of 3.5- and 2.5-inch drive bays out of the way is hot right now, too, and Rosewill obliges. The Gungnir has a two-bay 3.5-inch drive cage behind the PSU shroud, well forward of

the PSU mount, and offers two vertical 2.5-inch drive mounts on the back of the forward interior panel, so although the case does include two top-mounted 5.25-inch tool-less drive bays, the rest of the interior is clean and open. As a result, you can install graphics cards up to 15.35 inches in length without making any special adjustments or moving anything.

Gungnir supports standard ATX motherboards as well as microATX and Mini-ITX boards, and of course it bears the now-standard motherboard tray cutout for easy CPU cooler installation. You can mount 280mm radiators behind its front panel and beneath its top panel, and all five internal fan mounts accommodate both 120mm and 140mm fans.

We think you'll agree, that's an awful lot of case for \$65. Rosewill is increasingly offering enthusiast-grade products at bargain prices, and that's great news for enthusiasts, on a budget or otherwise. ■

BY CHRIS TRUMBLE

Specs: Dimensions: 17.3 x 8.3 x 18.6 inches (HxWxD); Materials: steel, plastic; Motherboard support: Mini-ITX, mATX, ATX; Drive bays: 2 x 5.25-inch external, 3 x 3.5-/2.5-inch internal, 2 x 2.5-inch internal; Fans (included): 2 x 120mm front, 1 x 120mm LED rear; Fans (optional): 2 x 140mm front, 2 x 120/140mm top, 1 x 140mm rear; Ports: 2 x USB 3.0, 2 x USB 2.0, audio I/O

"If you're looking for a feature-packed laser mouse that won't chew through your wallet, Patriot's Viper V560 is one of the best options out there."



Viper V560

\$49.99

Patriot

www.patriotmemory.com

Patriot Viper V560

In the past, we've known Patriot primarily by its blisteringly fast DRAM and flash memory products. When we were at CES this year, we were pleased to discover that, in addition to this mouse, the company is launching a range of new peripherals designed for enthusiasts and gamers. And perhaps best of all, they're very accessible for gamers of meager means.

The Viper V560 is a laser gaming mouse that has a rubberized matte black finish with glossy red buttons and highlights, as well as Patriot's red viper logo on the back-right corner of the mouse body. The left side of the mouse features a soft rubber pad that helps keep your thumb from sliding and losing grip, and the right side of the Viper V560 lets you swap between a pair of swappable side grips. The USB cable is red and black braided nylon.

There are three LEDs on the mouse and you can cycle between five colors,

including red, green, blue, cyan, and magenta. Each preset is tied to a color, and you can tweak the nine programmable buttons from the Viper utility. You can also adjust the lift-off, tweak the sniper function's DPI, enable/disable angle snapping, and create macros and store them on the V560. The software is easy to use and finding the function you want is fast and intuitive.

The V560 has an adjustable weight system that consists of a tray that holds up to six five-gram weights, accessible from behind the swappable side grip. The tray is centered in such a way that you can add weight on the right, left, front, or back, depending on your preference.

There's a DPI toggle switch that lets you cycle between four DPI presets and an LED indicator lets you know at-a-glance which setting you're on. With the software installed, you can move sliders to configure your presets, between 50 and 8,200dpi. We loved

that the DPI switch is a toggle that requires some force to adjust, which significantly reduces the chances you'll bump it unintentionally.

We used the V560 at low resolutions and up to 4K and found the DPI settings more than capable of handling our needs. The mouse looks good, and the ceramic pads feel good on fabric and plastic mousing surfaces alike; they'll also likely last longer than those Teflon stickers many mice ship with. The mouse's rather high peak makes it feel good in medium and larger hands, but it's narrower than some of the large-sized mice we've tested in the past. Patriot backs the V560 with a two-year warranty.

If you're looking for a feature-packed laser mouse that won't chew through your wallet, Patriot's Viper V560 is one of the best options out there. ■

BY ANDREW LEIBMAN

Specs: Sensor: Laser (50 to 8,200 DPI); Body Type: right-handed; LEDs: five color lighting in two zones; Adjustable weight system; 9 programmable buttons; Macros: Yes; Onboard Memory: Yes; Interface: gold-plated USB; Cable: braided red and black nylon

"... the Gaming 27T 6QE's AIO design also allows it to blend into spaces where traditional PCs may not."

GAMING 27T 6QE All-in-One PC

\$2,699.99 (as tested)

MSI

us.msi.com

MSI GAMING 27T 6QE All-in-One PC



The idea of using an All-in-One computer as a gaming desktop hasn't probably crossed the minds of many enthusiasts and gamers. And until we saw MSI's Gaming 27T 6QE All-in-One PC, we wouldn't have blamed you, as AIOs typically feature cut-down mobile versions of components and limited GPU horsepower. MSI flips the script with the Gaming 27T 6QE by packing an Intel Core i7-6700, as well as an NVIDIA GeForce GTX 980M with 8GB of GDDR5 memory, into an AIO with a 27-inch, Full HD display.

If you've read any of the reviews we've done recently on MSI's Gaming products, which include motherboards, laptops, and barebones systems, it should be no surprise that the Gaming 27T 6QE comes with a host of additions to improve the gaming experience. Top of the list is MSI's Audio Boost technology, which includes Nahimic Technology's audio processing software and the ESS SABRE HiFi Audio DAC (digital to analog controller) that can drive headsets at impedance levels as low as 16 ohm and as high as 600 ohm. The Gaming 27T 6QE's built-in speakers are respectable, as well. We found the audio quality to be reasonably detailed,

especially when using the Nahimic Audio Enhancer utility to tune the sound.

MSI's engineers put some thought into the visual aspect of the gaming experience, too. The 27-inch display features anti-glare and anti-flicker technology, which helps to reduce eye-strain. The Gaming 27T 6QE also lets you lower the display's blue light emissions to further lessen eye fatigue. The low blue light option can be found in the MSI Gaming Center utility, where you can also switch among other preset visual modes optimized for games and multimedia playback. The Gaming 27T 6QE is even compatible with multi-monitor setups. It supports two additional monitors via two HDMI outputs.

The Gaming 27T 6QE's storage subsystem is as impressive as anything you'll find on a prebuilt desktop PC. MSI pairs two 128GB Samsung SM951 PCIe SSDs in RAID 0 to deliver read speeds of up to 3,300MBps. In our testing, Windows and games loaded in no time. If you've got a big collection of personal media files, you'll like that MSI also includes a 2TB Seagate Barracuda HDD. For external I/O, this AIO includes a Blu-ray burner, as well as four USB 3.0 ports and two USB 2.0 ports. One of the

USB 3.0 ports boasts MSI's Super Charger technology to up the port's amperage for faster recharging of smartphones, tablets, and other mobile devices.

The majority of MSI's Gaming products feature some form of Killer NIC. The Gaming 27T 6QE boasts both Killer's E2400 (for wired connections) and Killer's Wireless-AC 1535. The wireless capabilities are notable, because the Killer Wireless-AC 1535 supports MU-MIMO (Multi-User, Multiple Input, Multiple Output) and beamforming for optimal range and wireless transmission speed. Killer's Doubleshot Pro technology is onboard, too, so you can direct bandwidth from the wired and wireless NICs to individual applications.

This gaming rig also comes with the traditional AIO amenities, such as an HD web cam, touchscreen functionality, and a sleek, clutter free exterior. If you want your gaming PC to do double duty as a living room PC, the Gaming 27T 6QE's styling is modern enough that it will fit nicely into contemporary spaces. MSI expands the Gaming 27T 6QE's functionality as a living room PC by including an HDMI input that lets the built-in display function as a standalone



The Gaming 27T 6QE includes an HDMI input so the display can function as a standalone screen.

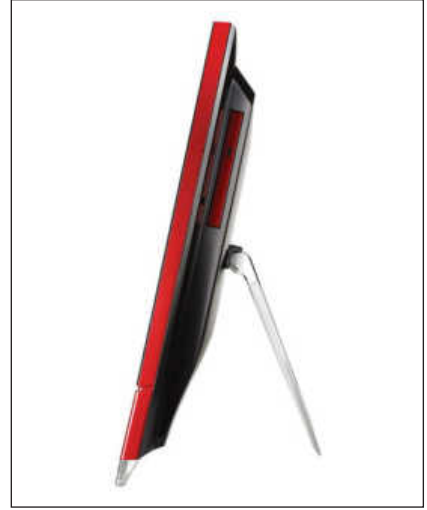
monitor. You'll be able to connect a game console or Blu-ray player, for instance. A VESA mount on the back of the Gaming 27T 6QE makes it easy to affix the AIO on a wall.

MSI bundles a gaming mouse and keyboard that match nicely with the Gaming 27T 6QE. The mouse is MSI's Interceptor DS100, which features a laser sensor with a sensitivity up to 3,500dpi. There are seven programmable buttons, including two DPI buttons behind the scroll wheel to adjust DPI on-the-fly. RGB LED lighting is present on both the mouse and the keyboard, so you can adjust the color to your décor. The keyboard, MSI's Interceptor DS4100, features keys that require very little pressure (55g) to actuate.

When it comes to our benchmark testing, we'll guess that you're primarily interested with how the AIO

can perform in games. We're happy to report that the Gaming 27T 6QE was able to post better than 45fps in all of our games, including the demanding Witcher 3, at the Gaming 27T 6QE's 1,920 x 1,080 native resolution. The AIO's results in CrystalDiskMark were outstanding, as well. The two Samsung SM951 PCIe SSDs posted a 2954MBps Sequential Read (Q32T1) speed and 1412MBps Sequential Write (Q32T1) rate.

The Gaming 27T 6QE retails for \$2,699.99, and the price makes sense, when you consider that laptops featuring NVIDIA's GeForce GTX 980M with 8GB of GDDR5 typically start at around \$2,000. Any such laptop, of course, won't house a 27-inch touchscreen display, nor will many deliver the mind-bendingly fast speed of two PCIe SSDs in RAID 0. Most importantly, the Gaming 27T 6QE's AIO design also allows it to blend into spaces where traditional desktop PCs may not. It fills a need for those who



This AIO gaming rig features a sleek, clutter-free exterior that is stylish enough for living rooms.

need to hide their gaming system in plain sight. ■

BY NATHAN LAKE

MSI Gaming 27T 6QE All-in-One PC

3DMark Fire Strike Score	8660	POV-Ray 3.7 (Pixels per second)	1632.67
Graphics Score	9901	Cinebench 15 (Points)	792
Physics Score	11781	CrystalDiskMark 5.1.1 (MBps)	
PCMark 8 Creative Score	4310	Sequential Read (Q32T1)	2954
SiSoftware Sandra 2016		Sequential Write (Q32T1)	1412
Dhrystone AVX2 (GIPS)	159.91	Random 4K Read (Q32T1)	712
Whetstone AVX (GFLOPS)	99.67	Random 4K Write (Q32T1)	535.5
Multi-Media Integer AVX2 x32 (Mpixels/s)	368.67	Games	1,920 x 1,080
Multi-Media Long-int AVX2 x16 (Mpixels/s)	157.4	Metro: Last Light (DX11, V High, 16XAF, V High Tess.)	66fps
Multi-Media Quad ALU x1 (Mpixels/s)	2	Dying Light (High, AO On, AA On, Vsync Off)	70.2
Integer B/F AVX/128 (GBps, mem bandwidth)	25.18	Witcher 3: Wild Hunt (Vsync off, Unl. fps, Ultra)	46.7
Floating B/F AVX/128 (GBps, mem bandwidth)	28.82		

Specs: CPU: Intel Core i7-6700; GPU: NVIDIA GeForce GTX 980M; RAM: 16GB DDR4-2133; Chipset: H170; Storage: 128GB Samsung SM951 (x2, Raid 0), 2TB Seagate Barracuda; Dimensions: 26.47 x 2.60 x 19.01 (HxWxD); Mouse: MSI Interceptor DS100; Keyboard: MSI Interceptor DS4100; OS: Windows 10 Home; Warranty: 1 year

GIGABYTE GA-Z170X-SOC FORCE

There's no mistaking the target audience for GIGABYTE's GA-Z170X-SOC FORCE. It's aimed squarely at extreme performance enthusiasts. Similar to previous iterations of GIGABYTE's SOC FORCE lineup, this motherboard is filled with exceptional overclocking features to push your Intel Skylake processor and system memory to new heights. Total benchmark domination is within reach, as well, because the GA-Z170X-SOC FORCE features a PEX 8747 bridge to overcome the multi-GPU limitations of the Z170 chipset. Did we also mention there are three M.2 slots that support RAID 0, 1, 5 configurations?

To easily tap into the power of the GA-Z170X-SOC FORCE, GIGABYTE provides an OC Touch section that lets you overclock on the fly, as well as quickly recover from missteps. The usual suspects are all here, such as the power, reset, and clear CMOS buttons. Where things really

get interesting is the button panel near the DIMM slots. GIGABYTE provides a series of buttons to raise or lower the CPU ratio, raise or lower the BCLK, and change the BCLK stepping ratio (from 0.1MHz to 1MHz).

For case mod demonstrations and testing watercooling setups, GIGABYTE provides an OC Ignition button that continues to deliver power to the motherboard and connected components when the system is shut down. There's also an OC Tag button to load a profile you've created in the BIOS and quickly apply custom settings.

The OC Touch section includes so many buttons that GIGABYTE can't fit them all onto the panel. One of these is the Settings Lock Button, which lets the motherboard remember your last successful boot settings—even after you've cleared the CMOS. There's also a Memory Safe button, which loads a failsafe DDR4 configuration. If you want

"If you want to achieve peak performance, few motherboards are better equipped for the job than the GA-Z170X-SOC FORCE."

to enter the BIOS on the next boot, you can press the Direct To BIOS button. The multitude of recovery options makes it easy to get back to the business of overclocking.

Not every function on the OC Touch panel is button-based. There are four PCIe DIP switches to let you can toggle on or off the individual PCIe x16 slot. This feature is particularly handy if you need to diagnose a problem with your GPU(s), because you won't need to physically remove the card which can be particularly challenging if your GPUs are part of the liquid-cooling loop.

To make it easier to hit and record target frequencies, the GA-Z170X-SOC FORCE includes an OC Trigger Switch that lets

GA-Z170X-SOC FORCE

\$399.99

GIGABYTE

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your system jump between the lowest CPU ratio and your current OC. This way, you can minimize CPU load during system boot and switch to the OC frequency when you're ready to chase records.

With so many onboard buttons and switches, the GA-Z170X-SOC FORCE shines on an open test bench, and GIGABYTE provides a few extras to ensure everything goes smoothly when you don't have the support of a traditional chassis. There's an OC Brace that functions as an expansion slot bracket and locks up to four GPUs in place. Two USB 2.0 ports are added near the SATA ports, so overclockers won't need to reach over an LN2 pot, for example, to plug in USB peripherals.

For convenient voltage readings, GIGABYTE includes eight voltage measurement cables, so you won't need to hold the lead of your multimeter to a measurement point. If a multimeter isn't handy, you can also monitor voltages (and adjust basic OC settings) via an Android or iOS device using GIGABYTE's HW OC app. You can use the app to adjust the CPU ratio, BCLK, and CPU Vcore, among others.

As you might imagine, GIGABYTE deploys precise power handling hardware to back up the board's OC capabilities. The board features a 22-phase digital power design, highlighted by 4th generation International Rectifier digital power controllers and 3rd Generation PowIRstage ICs. The GA-Z170X-SOC FORCE also features a large VRM heatsink with G1/4 threaded ports to let you easily install the fittings of your choice. The heatsink also functions well with passive air-cooled setups.

Benchmark Results: GIGABYTE GA-Z170X-SOC FORCE

3DMark Fire Strike Extreme	7582	POV-Ray 3.7 (Pixels per second)	1980.57
Graphics Score	7995	Cinebench 15 (Points)	927
Physics Score	13360	CrystalDiskMark 5.1.2 (MBps)	
PCMark 8 Creative Score	5854	Sequential Read (Q32T1)	559.4
SiSoftware Sandra 2016		Sequential Write (Q32T1)	292.5
Dhrystone AVX2 (GIPS)	194.9	Random 4K Read (Q32T1)	365.4
Whetstone AVX (GFLOPS)	113.59	Random 4K Write (Q32T1)	264.8
Multi-Media Integer AVX2 x32 (Mpixels/s)	409.68	Games	2,560 x 1,600
Multi-Media Long-int AVX2 x16 (Mpixels/s)	194.14	Metro: Last Light (DX11, V High, 16XAF, V High Tess.)	78.67
Multi-Media Quad ALU x1 (Mpixels/s)	2.22	Dying Light (High, AO On, AA On, Vsync Off)	84
Integer B/F AVX/128 (GBps, mem bandwidth)	33.74	Witcher 3: Wild Hunt (Vsync off, Unl. fps, Ultra)	59.5
Floating B/F AVX/128 (GBps, mem bandwidth)	34.17		

A flat heatsink over the PCH section shows off the SOC FORCE logo.

Hardware support on the GA-Z170X-SOC FORCE is tremendous. 4-way SLI or CrossFire setups operate at up to x8/x8/x8/x8, while 3-way GPU configurations run at x16/x8/x8, and 2-way setups run at x16/x16 speed. You can install up to 64GB of DDR4 memory at speeds as high as DDR4-3866. The three M.2 slots support type 2242/2260/2280 form factor drives, and these slots support both SATA and PCIe M.2 SSDs. Also onboard are eight 6Gbps SATA ports, and the majority of these share bandwidth with the M.2 slots. GIGABYTE includes a detailed chart in the users manual that details which slots will be disabled when you install an M.2 SSD.

It should come as no surprise that the GA-Z170X-SOC FORCE did well in our benchmarking. The motherboard turned

in a Cinebench 15 mark of 927 and a POV-Ray 3.7 score of 1,980.57 pixels per second. The results are some of the best we've seen from a motherboard paired with Intel's Core i7-6700K. Its performance in the processor-intensive tests within SiSoftware Sandra 2016 are also superb, such as the 409.68Mpixels per second in the Multi-Media Integer AVX2 X32 test.

If you want to achieve peak performance, few motherboards are better equipped for the job than the GA-Z170X-SOC FORCE. The mainboard is overflowing with extras to boost OC speed and manage settings. And compared to some previous SOC FORCE models, the GA-Z170X-SOC FORCE isn't designed solely for overclockers. Why shoot for personal bests when this motherboard will let you upstage everyone else? ■

BY NATHAN LAKE

Specs: Max memory: 64GB DDR4 (DDR4-2133; Max OC: DDR4-3866); Slots: 4 PCIe 3.0 x16, 3 PCIe x1; Storage: 3 M.2 (Type 2242/2260/2280), 3 SATA Express, 8 6Gbps SATA; Rear I/O: 1 Mini-DisplayPort, 1 HDMI, 1 DVI-D, 2 USB 3.1 (1 Type-C, 1 Type-A), 5 USB 3.0, 2 USB 2.0, 1 PS/2, 1 S/PDIF, audio I/O, 1 Ethernet, 1 OCPSW button; Form factor: E-ATX; Warranty: 3 years

Test system specs: Processor: Intel Core i7-6700K; GPU: PNY GeForce GTX 980 Ti; Memory: 16GB Kingston HyperX Predator DDR4-3000; Storage: 240GB Intel SSD 730 Series; OS: Windows 10 Enterprise

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State-Of-The-Art Standards

HDMI

HDMI[®]

HIGH-DEFINITION MULTIMEDIA INTERFACE

Ultra HD and 4K appear ready to ascend the display throne. A recent IHS report expects that Ultra HD TV panels are expected to account for 40% of TV shipments in 2016. The official 4K resolution, 4,096 x 2,160, is slightly larger than Ultra HD's 3,840 x 2,160 resolution, yet you'll often see 4K and Ultra HD used interchangeably in display marketing materials. Whatever the terminology, there's no doubt that the visual detail and clarity of the 2160p formats leave 1080p in the dust.

Display panel technology is only part of the equation, though, as interface standards must also support the more than 8 million pixels in Ultra HD and 4K. HDMI (High-Definition Multimedia Interface) has long been a dominant digital interface standard, and it has kept ahead of the times. For example, HDMI 1.4 (released in 2009) introduced support for resolutions of 4,096 x 2,160 and 3,840 x 2,160, but it did so at limited frame rates. The most recent HDMI specifications, 2.0 and 2.0a, improve

compatibility for 4K and Ultra HD, and add features for better image quality.

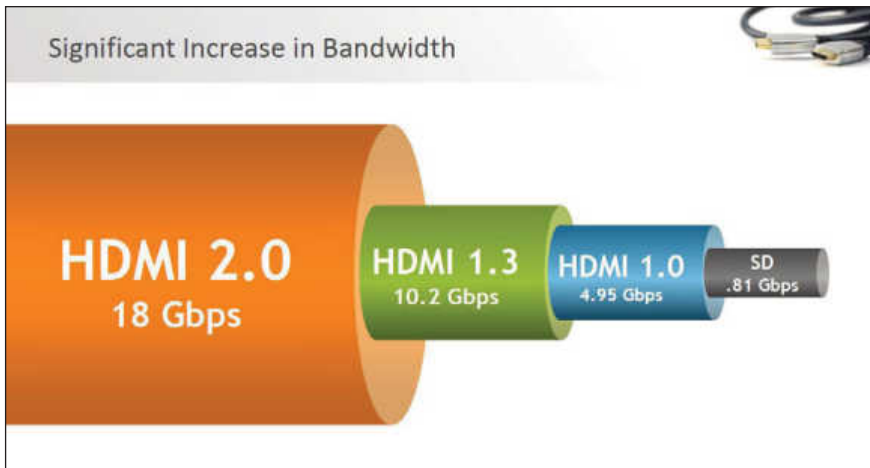
HDMI's Humble Beginnings

The original HDMI specification provided a maximum bandwidth

of 4.95Gbps, which allowed for up to 1080p video at 60Hz, as well as 8-channel, 24-bit audio. At the time of HDMI 1.0's release in 2002, merely combining digital video and audio in a single cable was a big deal. HDMI



Current High Speed HDMI cables will support the advanced features and bandwidth of HDMI 2.0.



HDMI 2.0 offers a much bigger data pipe than previous revisions.

eliminated the complexity of routing and connecting component, S-Video, RCA, and S/PDIF cables from A/V devices to digital TVs.

HDMI's all-digital signal was a big upgrade over component and S-Video cables, as the analog connections required digital-to-analog conversions that often reduced picture quality. The DVI (Digital Visual Interface) interface carries a digital signal, but DVI isn't a commonly available input on digital TVs, nor does it deliver an audio signal. HDMI 1.0 supports HDCP (High-bandwidth Digital Content Protection) to let the interface deliver premium content, and while it's an optional feature, most all devices that transmit or receive HDCP content support it.

HDMI 1.0 includes two-way communication between digital TVs and connected video devices, so the device can deliver the most ideal format, such as 720p vs. 1080p, to the given display. The two-way communication exchanges EDID (Extended Display Identification Data) information that includes the display's preferred resolution and refresh rate. The EDID could also include things like physical image dimensions and color characteristics.

HDMI 1.0 works with CEC (Consumer Electronics Control) devices to let you more easily control your home theater. With the CEC connection,

you can use the remote for one device to perform certain functions on other devices that are connected via HDMI cables. CEC's Remote Control Pass Through feature, for example, lets you send commands over HDMI to components behind doors or walls that would otherwise block IR signals. HDTV manufacturers typically rename the CEC feature with another title, such as Samsung's Anynet+.

With HDMI 1.1 and HDMI 1.2, HDMI Licensing, LLC (the governing body that licenses HDMI and maintains

the specification) revised the interface to support up-and-coming audio formats. HDMI 1.1 added support for DVD-Audio, while HDMI 1.2 provided support for the DSD (Direct Stream Digital) audio format developed for the Super Audio CD system. Maybe more importantly for PC users, the HDMI 1.2 revision added the ability for PC sources to use the native RGB color space, as well as mandated that HDMI 1.2 displays support low-voltage sources, such as the HDMI outputs from a PCIe graphics card.

HDMI Broadens Color Space

In 2006, HDMI Licensing, LLC announced HDMI 1.3, which brings a number of big improvements. To start, HDMI 1.3 ups single-link bandwidth to 10.2Gbps, more than double that of the previous spec. The extra bandwidth allowed HDMI to support new high-end, lossless digital audio formats of the time, including Dolby TrueHD and DTS-HD Master Audio. HDMI 1.3 also let source devices synchronize audio and video, which helps in situations where digital signal processing might lag behind the sound or video elements.

Version 1.3 delivered support for a greater color range, including 30-bit, 36-bit, and 48-bit color depths, which are

4K@50/60 over HDMI

4 times the clarity of 1080p/60 video resolution

Expands on existing 4k@24/30 resolutions to include 4K@50/60

If you tiled together four 1080p panels, you'd equal the resolution of one Ultra HD display.

also referred to as 10-bit, 12-bit, and 16-bit per one color depths. “Deep Color” is how HDMI refers to the color ranges, as the possible color options jump from 8-bit’s 16.78 million colors to billions. Deep Color is said to reduce on-screen banding and increase the available contrast ratio. HDMI 1.3’s Deep Color specifications were a bit ahead of their time, as we’re just recently seeing 10-bit monitors and 4K Blu-ray players capable of delivering content in 10-bit per one color depth.

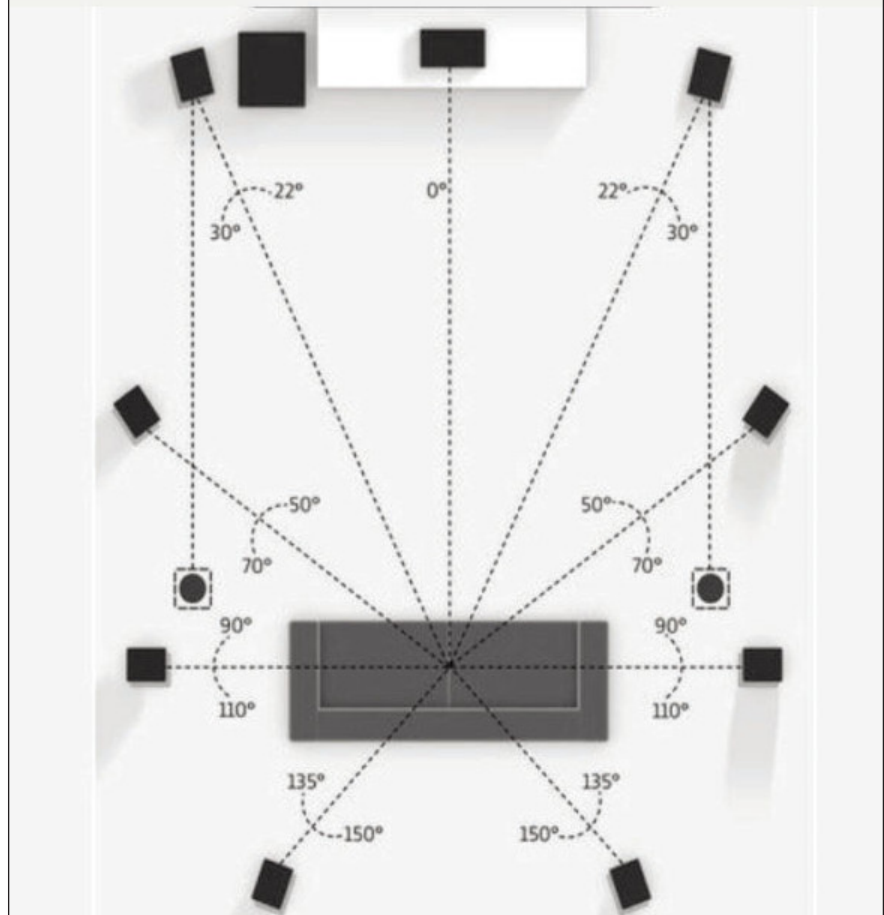
For better connectivity with portable devices, HDMI 1.3 introduced a mini HDMI connector that would better fit onto small devices like camcorders. There were several small revisions to the HDMI 1.3 standard, and these incremental changes generally focused on compliance testing for HDMI products and cables.

HDMI 1.4, 4K & 3D

The next major revision to HDMI wouldn’t be until May 2009, and it was a major step forward. HDMI 1.4 defined support for 4K at a maximum resolution of 3,840 x 2,160 at 24Hz/25Hz/30Hz or 4,096 x 2,160 at 24Hz. Because HDMI Licensing, LLC was so far ahead of the technology trends, it’s likely that your older PCs and multimedia devices support 4K resolutions. The restricted frame rates aren’t ideal for all types of content, but it’s nice that HDMI 1.4 devices aren’t deal-breakers for 2160p formats. HDMI 1.4 also adds support for 3D over HDMI at 1080p, and the specification supports a variety of 3D formats.

HDMI 1.4 introduced an ARC (Audio Return Channel) feature that allows you to route audio from your HDTV to an upstream connection, such as an A/V receiver. HDTVs typically can accomplish the same thing with an S/PDIF output, but adding ARC to the mix is just another way HDMI helps to eliminate cable clutter. At the time of HDMI 1.4’s release, ARC was touted as an ideal feature when running audio from the HDTV’s built-in TV tuner. And while ARC is certainly useful in this capacity, the arrival of smart HDTVs

9.1.2 Speaker Configuration



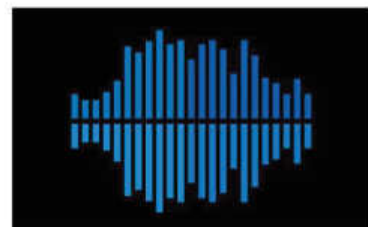
With support for up to 32 channels, HDMI 2.0 can pass along advanced speaker configurations, including this 9.1.2 Dolby Atmos example.

Up to 1536kHz Audio Sample Frequency for increased audio clarity

— Doubles the audio fidelity from the previous version of HDMI



Low Sample Rate



High Sample Rate

Tighter audio sampling, up to 1,536kHz, helps to improve audio fidelity in HDMI 2.0.

expands ARC functionality to pass along audio from online streaming services built into the smart HDTV, such as Netflix or Amazon Prime Video, to an A/V receiver.

One heavily marketed feature of HDMI 1.4 that hasn't gained much traction is HDMI Ethernet Channel. In practice, it allows HDMI devices to share video, audio, and IP-based data at up to 100Mbps. Few multimedia devices ever adopted support for HDMI Ethernet Channel, and it remains relatively unused today.

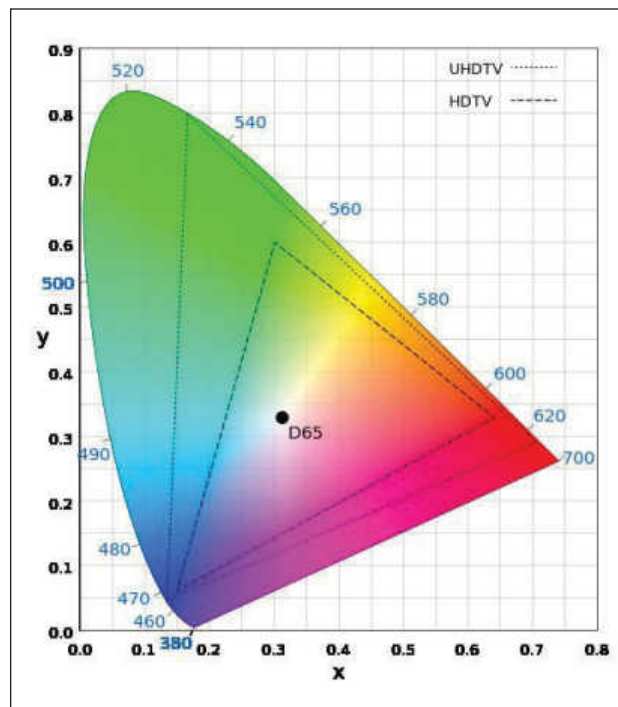
For better color quality with still images, HDMI 1.4 includes support for sYCC601, Adobe RGB, and Adobe YCC601. The additional color models allow for a wider range of color than HDMI's previous RGB color spaces and helps to provide consistent color quality when viewing still images on a monitor or HDTV. Lastly, HDMI 1.4 introduced a Micro HDMI connector, which is much smaller than even the Mini HDMI connector.

HDMI 2.0 Ups The Bandwidth

Released in September 2013, HDMI 2.0 was the first revision of the standard to be developed by the HDMI Forum's Technical Working Group. The group is made of up members that represent some of the world's leading manufacturers in consumer electronics, PCs, mobile

devices, cables, and A/V components. The 2.0 revision is highlighted by support for 4K and Ultra HD at 60Hz, as well as a bandwidth increase to 18Gbps. "When you consider 4K plus 60fps, you have now quadrupled and then doubled the amount of bandwidth required to transmit content," says Glenn Hower, research analyst at Parks Associates. "Of course compression will help, and no one will be transmitting raw video to their TV, but with high-resolution, high-frame-rate video, bandwidth is everything."

Officially, the 2.0 revision supports 4K and Ultra HD resolutions at both 50Hz and 60Hz. When compared to Ultra HD content displayed 24Hz or 30Hz, the quicker frame rates help to reduce the chance of on-screen flicker when viewing action-filled video. The 2.0 update was somewhat critical for HDMI to keep pace



HDMI 2.0 supports the wider color gamut of BT.2020.

Do You Need A New Cable For HDMI 2.0?

With the greater bandwidth available in HDMI 2.0, it's reasonable to guess that you'll need new HDMI cables. Fortunately, it's possible you can use what you have. HDMI Licensing, LLC indicates that High Speed HDMI Cables, also known as Category 2 cables, are designed to support the increased bandwidth needed to transmit 4K content at 60Hz. The HDMI Licensing, LLC, also has introduced the HDMI Cable Certification Program to further help consumers find HDMI cables that will deliver the best possible video and sound. "This program encompasses additional and enhanced HDMI cable testing, as well as a comprehensive anti-counterfeiting label program," says Jeff Park, senior manager of product marketing, HDMI Licensing, LLC. "This empowers participating HDMI adopters to design and test their High Speed HDMI Cables for ultra-reliability and the high performance typically needed for emerging 4K/Ultra HD content." Cables that meet the certifications will carry a tamper-proof, anti-counterfeit label, and there will be a mobile app to let you (and retailers) scan the label to confirm its authenticity.

with DisplayPort, which had supported 4K at 60Hz since 2009 with DisplayPort 1.2. HDMI 2.0's 18Gbps pipeline slightly lags behind DisplayPort 1.2 and 1.3's maximum data rates of 21.6Gbps and 32.3Gbps, respectively.

In addition to the improving refresh rates at 4K, HDMI 2.0 expands the color gamut with support for BT.2020, which is a color specification recommendation from the ITU (International Telecommunication Union). BT.2020 defines a larger color palette that will take better advantage of the formats using Deep Color. At 4K and Ultra HD resolutions, HDMI 2.0 supports the BT.2020 colorimetry at 24/25/30/50/60Hz.

The 2.0 revision brings massive improvements to HDMI's audio capabilities. To start, it ups the maximum amount of channels from eight to 32. "With the rise of content that supports new audio features, such as 3D and object-based audio, 32 audio channels will allow for multi-dimensional immersive audio experience beyond



MSI's GTX 980Ti GAMING 6G features an HDMI 2.0 port that supports 3,840 x 2,160 at 60Hz.

today's traditional 'surround sound,'" says Jeff Park, senior manager of product marketing, HDMI Licensing, LLC. Although placing 32 speakers might be a stretch for many homes' TV rooms, the end goal of having so many more channels is to provide a way for HDMI to deliver clearly perceptible, three-dimensional, and positional audio. And as we've seen with previous home entertainment standards, it never hurts to stay ahead of the curve.

For better audio clarity, HDMI 2.0 allows for up to 1,563kHz audio sampling, which is double what's found in previous HDMI versions. A higher sampling rate is ideal for delivering sound identical to the master source. The standard also introduces the aptly named Dynamic Auto Lip-sync, which helps to better synchronize video and audio streams than HDMI 1.3's sync

capabilities. "With the wide range of video content sources available today, video processing times vary greatly between content sources and/or devices," says Parks. "This can introduce delays in the audio/video timing."

Dynamic Auto Lip-sync happens without any user intervention, but like most HDMI features, it's up to the manufacturers to decide which HDMI features to support. Parks tell us that "For most consumer devices, we expect the support for 32 audio channels and Dynamic Auto Lip-sync to be fairly commonplace in newer and upcoming AVRs."

Gamers will like that HDMI 2.0 allows devices to split video and audio signals, so two people playing a game could enjoy their own view and game audio on a single screen. We've yet to see any implementations of this, but it's an

intriguing option should game designers decide to utilize it. HDMI Licensing, LLC indicates the multi-stream audio and video might also come into play in the car, as the driver could have the front screen display GPS directions, while people in the backseat could watch a movie and not have to listen to turn-by-turn navigation directions.

HDMI 2.0a

HDMI 2.0a is the latest revision, and it introduces support for HDR (High Dynamic Range) formats. Parks says "While HDR is not a color-specific feature, it does enhance the overall picture quality by simultaneously enabling greater details for both dark and bright parts of an image, including enhancing the existing color saturation and contrast." HDR is delivered via additional metadata, and HDMI 2.0a allows for devices to transmit and receive the data. Support for HDR was the only major revision in HDMI 2.0a.

4K & Beyond

"With the recent introduction of the Ultra HD Blu-ray specification, which includes support for 4K at up to 60 frames per second, HDR, BT.2020, and object-based sound, we expect a new wave of content to hit the market fairly soon," says Park. "Many future HDMI devices will add support for these features to take advantage of the new content experience in the home."

To date, HDMI has done an excellent job staying ahead of trends, and the HDMI Forum is working on further revisions. "We believe that the market will require support for higher video resolutions and frame rates (beyond 4K at 60Hz), additional HDR video formats, additional audio formats, and power over the HDMI interface," says Parks. "Addressing these trends with the next version of the HDMI Specification ensures that the HDMI interface will continue to support the highest level of audio and video quality." Looks like we haven't seen the last update to the HDMI specification. ■

Is My 4K Display Really 4K?

Many so-called "4K" consumer displays actually have a native resolution of 3,840 x 2,160. And while the resolution is certainly a lot of pixels, you'll notice that the pixel width doesn't quite reach 4,000. The official 4K resolution of 4,096 x 2,160 isn't commonly found on consumer displays because it features an aspect ratio (1.9:1) that's slightly wider than the 16:9 aspect ratio of 720p, 1080p, and Ultra HD TV content. The 4K moniker, though, seems to be a more catchy title than Ultra HD or 2160p, and has stuck around for marketing purposes. Where you more likely to view the 4,096 x 2,160 resolution is at cineplexes, as the films are sometimes shot at the official 4K resolution.

Alienware recommends Windows.

ALIENWARE 

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New Alienware laptops with Intel® Core™ i7 processors are here to usher in the next era of mobile gaming. Get full-throttle action anywhere, and with the optional Graphics Amplifier, truly intense at-home immersion.

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HARD HAT AREA
PC MODDER
MAD READER MOD



Trooper

Each year we judge lots of mod contests at lots of LANFest events across the United States, and at the end of each year, we put all of the winners into a final, overall contest and choose the best of the best. Picking a winner this year was difficult as it always is, but in the end, we came to a unanimous decision: Trooper, by Johnnie Rodriques and Lee “Pcjunkie209” Harrington is the overall winner of the 2015 LANFest season.

Dat Armor Tho

It’s not hard to see where the guys got the inspiration for Trooper; the right-side panel’s airbrushed helmet is very clearly the already iconic updated Stormtrooper helmet from “Star Wars: The Force Awakens.”

“I have always been a big Star Wars fan,” Rodriques says. “The NZXT Noctis case was released in April 2015, and looking at it, I saw hints of the Stormtrooper armor. With that idea in mind, I did some research and found some good images of Clone Troopers and chose the blue armor accents, representing a commander.”

On the left side of the rig, you can see the emblem of the First Order (emblazoned on the side and wrapping around onto the front panel) and the Imperial Crest (on the backplate of the system’s graphics card), both images that have been tied to Stormtroopers at various times throughout the Star Wars saga.

And, as Rodriques points out, the blue accents on the front panel—complete with battle scarring—denote a trooper commander.

By Our Powers Combined

Trooper is the first mod featured in CPU’s Mad Reader Mod by Rodriques, but many readers will likely recognize Harrington’s name, as he’s had Mad Reader Mod winners on our cover twice, in our March (Diablo Azul) and September (F&G Project) 2011 issues.

“I work with computers every day,” Rodriques tells us. “Part of my job is building custom systems, including enthusiast gaming

systems. Occasionally, I have the opportunity to do a crazy modded build, and I do a lot of the concept and design in my lab at work. After that, I will usually work with a professional modder, like Lee Harrington of Pcjunkiemods, to do the final build. I’m a designer and only an amateur modder. The really cool stuff is done by people like Lee. The work he does, like in this build, is amazing.”

“Johnnie is too kind!” Harrington says. “I recently moved into a 5,700 square-foot shop that I share with Mainframe Customs, which works out great when I need mod supplies. For the most part now I am able to work on multiple projects at once. I have separate work areas, depending on the work being done. Like a clean area and a cutting and grinding area.”

The duo tell us that they spent about three to five weeks on Trooper, including custom airbrushed paint, carbon fiber wraps, custom-cut vinyl accents, and of course paint, assembly, and so forth. Rodriques and Harrington outsourced the custom CPU waterblock with circuit graphics cut into it to Performance-PCs.

“There’s always a few things that don’t turn out as planned,” Rodriques says. “For example, the Intel SSD 750 Series PCIe drive was supposed to have a waterblock from EK, but we couldn’t get it in time to complete the build for LANFest. I’m a bit of a perfectionist, so I see everything that isn’t perfect that otherwise goes unnoticed, but I’m very happy how this build turned out.”

“Honestly, I thought the mod came out super-clean,” Harrington says. “When Johnnie first described what he wanted, I was a little skeptical on the outcome. But the end result is awesome!”

Trooper Field Gear

Aside from the aforementioned NZXT Noctis 450 case, Trooper consists of an Intel Core i7-5960X mounted on an MSI X99S LSI Krait Edition motherboard, 32GB of Corsair Dominator Platinum Series DDR4-3000 memory, two EVGA GeForce GTX TITAN



X graphics cards, a Corsair AX860i power supply (with custom-sleeved cables, natch), two Intel SSD 730 Series 480GB drives, and an Intel SSD 750 Series 1.2TB PCIe drive.

The rig's cooling subsystem includes the customized EK-Supremacy MX CPU waterblock, EK-FC Titan X waterblocks with EK-FC Titan backplates, an EK-XTOP DDC pump, EK, Bitspower, and PrimoChill fittings, PrimoChill PETG tubing, a 360mm PrimoChill Frosted CTR Phase II reservoir, a Koolance PMP-400 pump, and two Hardware Labs 360mm radiators.

Trooper Clones?

Rodriques tells us he's built a number of custom systems, and of course we know quite a bit about Harrington's work. In addition to the Mad Reader Mods mentioned earlier, Harrington built a mod called "Simplicity" for EK that you can find out more about on Intel's Expertmode videos on YouTube along with many others.

But it sounds like Harrington and Rodriques plan to collaborate again on mods, and Rodriques also mentioned a possible joint project with Ron Lee Christianson, another two-time Mad Reader Mod winner.

Harrington is also just getting started on a new liquid-cooled dual-Xeon workstation.

"In that build, I will be using a Dell XPS BTX chassis that will require a lot of fab work," Harrington says.

Based on what we've seen from Harrington over the years, his work will certainly be fab. ■

We Want Your Mod

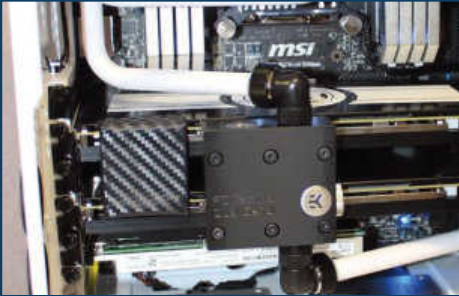
Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. If we choose your system as our "Mad Reader Mod," you'll win \$1,500! (U.S. residents only, please.)



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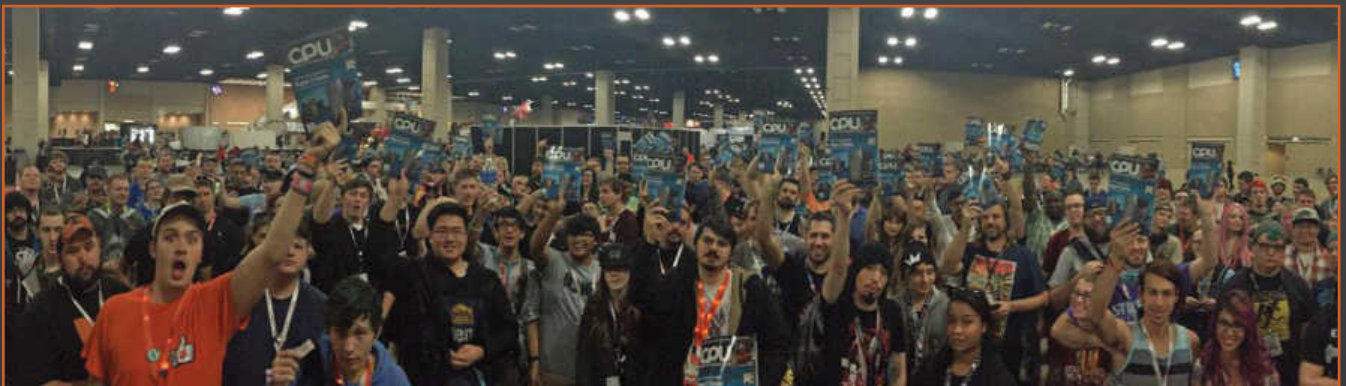
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PAX South 2016

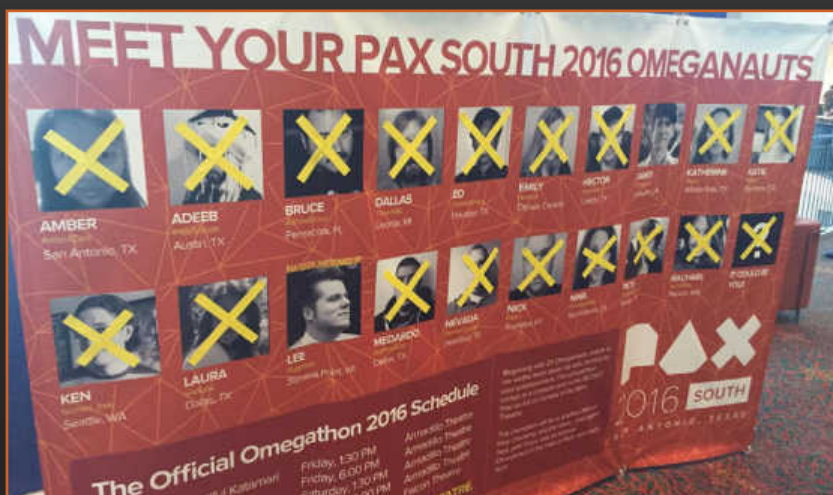
Enthusiasts Rally In San Antonio

At the end of January, groups of like-minded individuals gathered together to share their passions, forge new alliances, and maybe even engage in a spirited debate. We're talking of course about the return of the Penny Arcade Expo to Texas, a state that suddenly finds itself hosting a staggering number of major events (also QuakeCon, SXSW, and the brand-new DreamHack Austin). It's good to be a geek in the Lone Star State.

The second ever PAX South convened on Friday, Jan. 29, and wrapped up two days later. A "smaller" affair than its two older brothers, PAX Prime and PAX East, PAX South was nonetheless jam-packed with things to do. Whether you wanted to attend a bunch of panels, rock out at a concert, grab a seat in the Main Theatre for Storytime with industry legend Cliff Bleszinski or PA VIPs Gabe and Tycho, or simply meander through an expo hall full of exhibitors (including *Computer Power User!*), PAX South made it easy for attendees to fill up their days with fun. Be sure to view this article online at URLURLURL for tons of bonus pictures.



Apparently, when you give away thousands of dollars of computer hardware, including a complete gaming PC, it tends to draw a large crowd. What can we say? We like to give back to the power user community.



A staple of every PAX event since PAX 1.0, the Omegathon is a brutal struggle that spans all three days of the event, and the final is the last official event of the show. Omegonauts compete against each other in a series of elimination games (this year's slate included Beautiful Katamari, Kerplunk, Geometry Wars, Super Avalanche 2, Lumines Live) that culminated in the final showdown: a best two out of three in the N64 classic Goldeneye. In the end, last year's runner-up Lee found himself the bridesmaid yet again, losing to champion James.

Welcome To The Game Show

Unless Pinochle and Jenga are your games of choice, it's safe to say that PAX South has something for you. Videogames take center stage, naturally, but tabletop gaming has a huge presence at the show, as well. PAX South's Expo Hall was loaded with exhibitors give attendees the chance to play several highly anticipated games, check out new and upcoming gaming gear, and of course score lots and lots of swag. Everywhere we turned, there was something new to see and, in most cases, do.

PAX South provided an abundance of opportunities for PC gamers to have a blast. At Alienware's booth, attendees could take a ride with the company's latest beast of a machine, the Area-51 (right). LANFest was back (below), and if you didn't bring your own system, Intel had a bank of systems loaded with games set up in the PC Freeplay area.



The brothers Mario, equipped with some serious Goomba-walloping upgrades, take a stroll through the main floor. At PAX South, like other PAX events, you never have to look far to find cosplayers who are extremely devoted to their craft.



PAX draws gamers of every kind. The event's tabletop freeplay area was buzzing at all hours of the show, bringing in people with impressive CCG decks (left) or those with the precision and patience for minifigs (below).



Mods On Parade

Any event that puts a big focus on PC gaming is bound to have a strong showing of excellent mods, and we found a few great ones at PAX South. A couple turned up in the LANFest BYOC, and there were several more skulking about the Expo Hall, waiting to be discovered. As usual, we judged the field at the LANFest mod contest, and the winner is our first contender for the 2016 LANFest Mod of the Year.



This extreme close-up of mod contest champion Michael Evans' Beater Box shows that it's possible to cram a complete custom liquid cooling loop into a ridiculously small case. Said ridiculously small case is an NCASE M1, which Evans modded from top to bottom. He took a Dremel to the M1's side and top panels and replaced them with clear acrylic that he beveled with 45-degree angles. Evans also added scoring to the system's GPU waterblock, RAM heatsinks, and several other parts to give the Beater Box its beaten-up look. Although Evans took home the trophy, he credits fellow modders Hassan Alaw and Joe Mercado for helping to bring the mod to life.



This mod contest turned out to be the friendliest competition yet, as the runner-up, Trevor, came to PAX South with Evans. Making ample use of custom-cut acrylic, the system was cool, clean, and unique.



When you have the opportunity to use a reservoir as a big ol' Tesla Cannon, you take that opportunity every time. This crazy-cool Overwatch mod featured at Intel's booth is the handiwork of a pair of Lees: Mad Reader Mod alumni Lee Harrington and Ron Lee Christianson.



We just had to (sort of) get in on this modding craze, too. At the CPU booth, attendees had the opportunity to feast their eyes on Alain Simpels' Deepcool Tristellar Whetstone mod, which will be touring the country with us this year.

Winner Winner, Hardware Dinner

Team *CPU* attends every Penny Arcade Expo in the country, and we do so for a lot of reasons. We get to talk shop with fellow power users, introduce other attendees to the world of hardcore PC hardware, and of course, give away lots of fabulous prizes.

Many entered, but in the end our Silent Knight custom gaming PC rode off into the sunset with Frank B., and it couldn't have come at a better time. Frank built his current PC four years ago and was preparing to upgrade.

"I guess I don't need to anymore," he says. We'd call that an understatement.

Frank says he's an avid PC gamer and plans to use his new rig to play League of Legends, Fallout 4, and the Batman: Arkham series.

Congratulations, Frank!



Sometimes being snakebit isn't such a bad thing, particularly if you're Menhsin C., who came to PAX South and left with an armload of Patriot Memory Viper Series gaming gear.



Allen W. took home a solid mechanical keyboard from AZIO, Audio-Technica's ATH-M50x headphones, and the ability to turn those headphones into an epic headset, thanks to Antlion Audio's ModMic. We also gave him Antlion's new Über-Wide mousepad.



Have a seat! Hiding behind, and beneath, winner David is one of DX Racer's new Iron Series gaming chairs. David eventually wheeled the chair away, but not without relaxing for a bit.

The GXL 2015: TITAN

Who Won The Battle For Philadelphia? Everyone

Last October, 400 gamers converged on The Philadelphia Expo Center in Oaks, Pa., for The GXL 2015: TITAN. This LAN party kicked off at noon on Friday, October 16, and ran through 5 p.m. on Sunday, October 18. Well, sort of, anyway. According to the official TITAN schedule, you could actually check your system in and start gaming as early as 12:01 Friday morning, at which time “Premature Lanners” were admitted. The event included contests and tournaments in Unreal Tournament 2K4, Counter-Strike: Global Offensive, Rocket League, Guitar Hero 3, Tetris, Halo 4, Mario Kart 8, StarCraft II: Heart of the Swarm, Left 4 Dead 2, Hearthstone, DOTA 2, Half-Life 2, Ultra Street Fighter 4, Super Smash Bros. 64, Team Fortress 2, and more. There were also eSports trivia contests, a cable-sleeving demo and contest, and (of course) a *CPU* case mod contest.



Mods In The House

Our mod contest came down to four great-looking rigs. One was packed into a Corsair small-form-factor case, one was built into Apple's very attractive G5 case, one had a cool Borderlands theme, and the last (our winner) was a custom build with a unique structure and very sharp internals built by Alex Quaintance, aka FrozenQ of FrozenQ PC Tech. (You may be more familiar with the site's previous name, FrozenQPCMods.) FrozenQ also brought the Borderlands mod ("VaultHunter.exe") to the party.



Gravity, the mod that won The GXL 2015: TITAN's *CPU* case mod contest, is a FrozenQ custom build.



You might recognize the charming fellow etched onto the side of VaultHunter.exe as the bandit from the cover of Borderlands, one of the greatest FPS games ever made. This mod is another FrozenQ production.

WinMac, a high-powered (Windows) gaming PC, tucked neatly into the confines of a Mac G5 tower case.



Brutus, another mod entered in our contest, is a powerful gaming PC built into Corsair's Obsidian Series 250D, a Mini-ITX case that nonetheless had all the space inside that it needed.

Massive LANFest MLP'O16 Winter

The second weekend in January saw the observance of a time-honored tradition at the Erie County Fairgrounds in Hamburg, New York. Starting at 5 p.m. on Friday, January 8, MassiveLAN (or LANFest MLP, as it is more recently known) held its 2016 Winter edition LAN party, which ran through Sunday the 10th, and included contests and tournaments in Counter-Strike: Global Offensive, Rocket League, America's Army, League of Legends, Guitar Hero Live, and Magic: The Gathering, as well as free-play Garry's Mod and Team Fortress 2 events. In addition, there was a pizza feed on Saturday evening, a trivia game on Sunday afternoon, and (of course) a big prize raffle.



HARD HAT AREA

PC MODDER



MassiveLAN's network admin, Dennis Nedry, had to leave unexpectedly for something or other.



Fabulous trophies were awarded for feats of heroism and exceptional valor!



The end-of-the weekend hardware raffle is always one of a LAN party's most popular events.



The MassiveLAN staff also concocted a fairly novel new contest: They put slips of paper with letters on them inside balloons, blew the balloons up, and put them in a ball-pit-like construct with chairs holding the colorful game pieces at bay. Teams were chosen and then given five minutes in the pit to pop balloons, retrieve letters, and put together the longest word they could. Members of the team with the longest word won prizes!



Cash & Fabulous Prizes

Cooler Master's Case Mod World Series 2016 Is Underway

We recently had an opportunity to talk to Cooler Master's Strategic Alliance Manager Michelle Wu about Cooler Master's Case Mod World Series 2016 contest. Check back for more info on the Case Mod World Series 2016 as the contest develops.



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Q: Tell us about Cooler Master's Case Mod World Series 2016!

MW: The Case Mod World Series is about fuelling the growing worldwide passion for modding. It's about

igniting the modding spirit—the maker spirit—on the web and right in your community. This year, we will be running local events to involve modders everywhere. Our winners have included everyone from first-time tinkerers to seasoned veterans, but

it's not just about the hype and the prizes. The field is open and all you need is that itch, the itch to tweak, improve and go beyond what you are given.

Join a community that shares your passion, grow together and then make it your own.



Q : What kind of prizes are up for grabs, and are there any age or location restrictions for signing up?

MW : Some fantastic prizes totaling \$30,000 are in store for this year's winners. If you've ever gone beyond the factory-farmed PC, then you'll recognize ASUS, Avexir, Dremel, NVIDIA, and OCZ. These are the people that might just be making your case hum this year, and they're certainly assembling an impressive package of prizes. Without them, this competition would not be able to offer such a sweet range of high-end gear.

Avexir has stepped up as a first-time sponsor this year with their RAM lines, including premium ASUS ROG-certified DDR4 modules for this year's first-place winners. OCZ keeps pace with sizable SSDs from their heavily decorated, award-winning Vector 180 series. Pile on NVIDIA's coveted GeForce graphics cards, massive motherboards from ASUS, and precision rotary tools from Dremel, and try not to spasm thinking about how you could deck out your case.

As for restrictions, the competition is open to everyone worldwide, and residents of the United States and Canada must be at least 18 years old to enter.

Q : So registration recently opened, and it runs through June 12, correct? Where can modders sign up, and what does the registration process entail?

MW : Modders can sign up at our event site and can find out more about the process at mod.coolermaster.com/en-us/infocenter/10.

Q : Who will be judging entries in the contest, and what are the criteria they will be using?



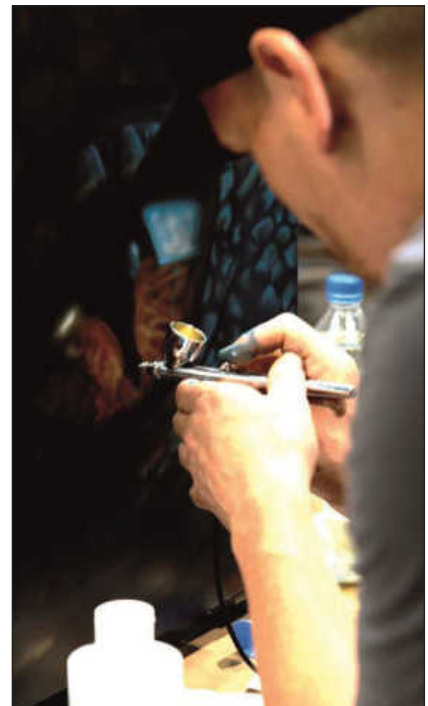
MW : Judges on this year's panel will feature recognized names from around the globe, including Ermanno Bonandini from Italy, Ronnie Hara from Brazil via Japan, Richard Keirsgietter from the Netherlands, Antony Leather from The UK, Richard Surroz and Brian Farrell from the U.S.A. Our sponsors (ASUS, Avexir, Dremel, NVIDIA, and OCZ) will also be participating in the judging process from their respective fields of expertise, and they will be basing their scores on four equally weighted areas: (1) complexity, (2) design, (3) originality, and (4) overall look.

Q : How did you pick your judging team, and how much weight will public voting have in the final decision?

MW : That's easy! We chose some of the most well-known, established professionals in the game today. Year after year, they crack out the biggest, baddest, and craziest cases on the planet, including mods that have won previous Case Mod World Series competitions. Considered the cream of the crop, these guys have the masterpieces to prove it.

This year will see a mix of new and familiar faces from four continents for a truly international powerhouse panel. Ronnie Hara has been gaining widespread recognition since his bit-tech Mod of the Year 2013, and Richard Keirsgietter has built more than 45 cases in just seven years. Antony Leather has been covering mods and tech news for over a decade on bit-tech. Richard Surroz's modding has propelled him into mainstream media, including TV appearances with Vanilla Ice. This year's first-time judges include Ermanno Bonandini from Italy and Brian Farrell from the USA, both with ample experience in the modding scene.

Needless to say, this year's contestants should be on their toes! ■



Modder Q&A: Rod Rosenberg

On Sleeving, Filing & Modmanship

Rod Rosenberg has been modding PCs since 1999 and has appeared in *CPU*'s "Mad Reader Mod" feature twice with solo projects and twice more as part of BS Mods, a prolific modding duo that includes Rosenberg and Bob Stewart.

Q: We first got to know you at PDX-LAN, thanks to your excellent Trash80 mod! Do you still have it?

RR: Yes, it was used by Intel at IDF and currently has a 3770K running in it!

Q: That was in our May 2008 issue, and exactly one year later you were on the cover again with your Steel Curtain mod. In that issue, you told us you had been modding since 1999. What was your first project?

RR: My first Mod was really more about performance. I had a dual-Celeron 500 system with an ABIT BP6 mobo and installed it in a Koolance

case with the CPUs on water. I also lined the entire case with heavy felt and added dual front 120mm fans for intake.

Q: And now, nearly 17 years later, you're one half of the BS Mods team. What do you remember about the first mod that you worked on with Bob Stewart?

RR: I got stuck doing the sleeving! It was a beautiful build with dual Xeons and a very unique "Bob Stewart Paint Job" using natural sea sponge for the primary effect.

Q: Sometimes when Bob is painting a case, do you tell him he missed a spot just to mess with him?



RR: I'm sure I've done that, we always have a ton of fun when working in the shop.

Q: How many times have you attended PDXLAN over the years?

RR: I've been to every major PDX-LAN since 8, and we're soon attending 27. So that makes 19 main events and a handful of charity LANs.

Q: We've always kind of been blown away by the ridiculous amount of modding talent on display at that LAN every year. Why do you think the Pacific Northwest is such a modding hotspot?

RR: Well, we're not in Silicon Valley, but having a crazy number of tech companies in the Pacific Northwest, like Intel, Microsoft, Micron, and Valve,



Rosenberg's first appearance in *CPU* came in 2008 when he won the case mod contest at PDXLAN with his Trash80 mod, which also earned him a spot in "Mad Reader Mod" and \$1,500.



Rosenberg's favorite project, Throne Industrial.

drives much of that along with events like PDXLAN and PAX. We're also a community of modders that strive to inspire others and drive ourselves to greater heights!

Q : If you had to pick one of your mods to be the one people most associate with you, which one would you choose, and why?

RR : I think I'd have to go with the Throne Industrial Mod. It has so many elements that show the quality Modmanship®.

Q : Have you ever gotten a few days into a project and then regretted having started it?

RR : Sometimes a few days in a project won't look like much and you can start to wonder if it will come out. Most of the time the mod takes shape and you start to really get into the design.

Q : If a beginning modder asked you for recommendations on what tools they

should buy, what would be the first thing you'd tell them to get, and why?

RR : Some old, quality files. I don't think I've ever worked on a mod where a file wasn't used. In total, I think I have about 30 types of files, but it only takes about three to five to really get started. The very best files can be found at garage sales and flea markets for a couple dollars each!

Q : Which would you rather do: sleeve a full set of power supply cables, or disassemble and strip a case to prepare it for painting?

RR : Ugh. I think sleeving is the bane of modding; I can't stand doing it. (Sorry, sleeving guys!) I love stripping a case, though. It's really the birth of a mod, as you unwrap the elements you have to work with and throw away about 30% of what was shipped in the box!

Q : What do you do for fun when you are not modding?

RR : I build things! Recently, I've spent a ton of time improving on my shop space and I've taught myself how to run both a wood lathe and a metal lathe.

Q : OK Rod, it's time for Five Quick Questions!

1) NVIDIA or AMD?

Mod them all!

2) Arnie or Sly?

Bob Stewart could take 'em both!

3) Seahawks or Broncos?

Steelers! (For my wife, the number one fan of my modding.)

4) Cooling loop: rigid or flexible?

Rigid for sure!

5) Quake or Half-Life?

Half-Life! Hey, do you guys at CPU know when HL3 is coming out?

[ED NOTE: Yes, but that information is highly classified. We could tell you, but we'd have to kill you.] ■



Rosenberg and Bob Stewart hard at work on a project for NVIDIA's GeForce Garage.

Best-Case Scenario

Find A New Home For Your Hardware

With requirements that often include support for gigantic graphics cards, custom liquid-cooling loops, and stacks of fans, power-user builds demand a well-designed case. Fortunately, case manufacturers are well aware of our needs. Modern cases, even entry-level models, generally provide proper cable management and enough internal flexibility to cope with the majority of high-end hardware. Premium chassis build upon the basic amenities, such as CPU cooler cutouts and tool-less, removable drive trays, with a fit and finish that won't require a modder's touch to deliver the internal and external look you desire.

Free-Range Storage

Although most cases are not yet "cage-free," case manufacturers now provide some alternative mounting locations for your storage devices, so you won't necessarily have to pack them into drive cages behind the front panel. Mounts behind the motherboard tray are the most common option for 2.5-inch (and sometimes 3.5-inch) storage devices. And while one or two drive cages are still typically present, the cages are often removable or height adjustable to maximize support for long graphics cards. The reduced need for optical media has also led some case manufacturers to exclude 5.25-inch drive bays. In turn, this opens space near the front and top panels for gear such as radiators and reservoirs.

Window, Color & Finish Options

A few of the cases in our guide are offered in windowed and non-windowed versions, so if you don't want or care about a side-panel window you can save a few bucks. When it comes to the exterior aesthetic, we found a multitude of cases offered in black and white options, among other colors. Case manufacturers often provide an appealing accent color, such as red or orange accents on a black case or blue accents on a white case. Happily, we've come a long way from the beige boxes of yore.

The case plays a huge part in the "wow" factor of your build, and we know how important it is to select a chassis that matches your exact needs. On the following pages, we examine the strengths of many of the latest cases. Dimensions are listed in the **height x width x depth** format, and you'll find a chart at the end of the guide where you can quickly and easily compare the key features for all the models listed.

be quiet! Silent Base 600

\$109.90/\$119.90 (Window)

www.bequiet.com

Why You'll Dig It: The Silent Base 600 is the mid-tower version of be quiet!'s Silent Base 800, and it delivers the same innovative sound proofing and near silent cooling performance in a slightly smaller size. That being said, it still provides enough space for high-end components, as you can install GPUs up to 16.2-inches long if you remove the upper 3.5-inch drive cage. Even with the drive cage, this mid-tower supports GPUs up to 11.5-inches long. be quiet! offers windowed and non-windowed versions of the Silent Base 600. The top panel supports dual-length radiators and you can mount a single rad behind the front panel for liquid-cooling support. The Silent Base 600 is full of helpful amenities, including a three-step fan control switch behind the front panel, big case feet with rubber insets, and SSD mounts on the back of the motherboard tray.

Who Should Apply: Power users who want to keep things quiet, whether it be a budget build or a system filled with high-end hardware.

Dimensions: 19.4 x 9.1 x 19.5 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 3 x 5.25-inch external, 3 x 3.5-inch internal, 3 x 2.5-inch internal



Fractal Design Define S

\$79.99/\$89.99 (Solid Panel/Window Panel)

www.fractal-design.com

Why You'll Dig It: Fractal Design forgoes drive cages in this case to expand air and liquid-cooling support. The Define S can support up to a 420mm radiator in the front panel, as well as up to a 360mm radiator in the top panel. Fractal Design pre-drills holes on the bottom panel to let you easily mount the majority of DDC and D5 pumps. To hold reservoirs in place, the Define S features adjustable mounting brackets, which are located where drive cages would traditionally go. On the back of these mounting brackets, the Define S provides three mounts for 3.5-inch or 2.5-inch storage devices. Two more 2.5-inch mounts are available behind the motherboard tray. Besides allowing for big radiators and other custom cooling loop hardware, the design allows for a straight front-to-back airflow path. Strategically placed sound-dampening materials are included to reduce noise without compromising airflow.

Who Should Apply: Liquid-cooling enthusiasts who want maximum space and support for radiators, reservoirs, and pumps.

Dimensions: 17.8 x 9.2 x 20.5 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 3 x 3.5-inch/2.5-inch internal, 2 x 2.5-inch internal



Cooler Master MasterCase Pro 5

\$139.99

www.coolermaster.com

Why You'll Dig It: The MasterCase Pro 5 comes with several of the parts and accessories that are optional add-ons for the lower-priced MasterCase 5. The extras include a windowed side-panel, a top cooling bracket, and a mesh top cover. Liquid cooling enthusiasts will like the top cooling bracket, as it extends the space in the top panel to support radiators (up to 280mm long) and fans (up to 65mm for radiator and fans). The mesh top cover hides your radiator and fans while providing a look that matches the case's exterior structure and aesthetic. The clear windowed side-panel features a tinted add-on that attaches to the bottom of the panel and conceals the power supply partition. The MasterCase Pro 5 also comes with an extra HDD bay that provides three more slots for 3.5-inch drives.

Who Should Apply: Builders who want the best that Cooler Master's FreeForm Modular System has to offer.

Dimensions: 20.2 x 9.25 x 21.6 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 2 x 5.25-inch external, 5 x 3.5-inch/2.5-inch internal,
4 x 2.5-inch internal



be quiet! Silent Base 800

\$139.90/ \$149.90 (Window)

www.bequiet.com

Why You'll Dig It: be quiet! combines sound insulation materials with its whisper-quiet fans, which makes the Silent Base 800 one of the best cases to prevent system noise. On the non-windowed version, for example, both the side panels and the front panel feature foam to dampen sound. be quiet! also pre-installs its excellent Pure Wings 2 fans, including two 140mm units behind the front panel and a 120mm in the rear. The Pure Wings 2 fan features an airflow-optimized design that reduces fan turbulence. There's space for up to four more fans, including two 140mm/120mm in the top panel, a 120mm in the bottom panel, and a 120mm behind the left side panel. To provide internal flexibility, the 5.25-inch drive cage and both of the 3.5-inch drive cages are removable. You can also replace the 5.25-inch drive cage with one of the 3.5-inch cages.

Who Should Apply: Enthusiasts who prize quiet operation and internal flexibility above all else.

Dimensions: 22 x 10.5 x 19.5 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 3 x 5.25-inch external, 7 x 3.5-inch internal, 4 x 2.5-inch internal



Cooler Master MasterCase 5

\$109.99

www.coolermaster.com

Why You'll Dig It: It's built to be adjustable and customizable. Cooler Master's FreeForm Modular System lets you vertically adjust the position of drive bays and system fans, so you can find the ideal spots for internal amenities. The case's Clip-and-Click panels can also be used to integrate optional accessories, such as extra fan brackets for reservoirs. The MasterCase 5 supports up to six 140mm fans, including three 140mm fans in the front panel. The big space in the front panel provides the necessary room for a 280mm radiator. There's also a shelf directly above the PSU to separate it from your system's big heat generating components. Cooler Master smartly includes two cable management openings into the shelf, as well as two 2.5-inch drive mounts. If you'd rather hide your SSDs, there are two spots behind the motherboard tray.

Who Should Apply: Power users who demand the ultimate modularity inside and outside a case.

Dimensions: 20.2 x 9.25 x 21.6 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 2 x 5.25-inch external, 2 x 3.5-inch/2.5-inch internal,
4 x 2.5-inch internal



Deepcool Genome

\$249.99

www.deepcool.com

Why You'll Dig It: Deepcool pre-installs a closed-loop CPU cooler into the Genome, and the loop features a 360mm radiator, Deepcool's CAPTAIN visual flow pump-cold plate unit, and a double-helix shaped reservoir. The latter is built into the front panel, so you can see the coolant. Deepcool offers the Genome in a few models, each with its own coolant color. There's one with red coolant and black exterior, one with green coolant and black exterior, and one with blue coolant and a white exterior. The Genome also features a large side-panel window, so you'll be able to clearly see the hardware inside your case. There's even a riser slot, so you can mount your GPU vertically and show off its cooler through the side-panel window. The 3.5-inch drive cage and PSU mount beneath a partition to prevent heat from affecting your GPU, motherboard, or memory.

Who Should Apply: Power users who want the look and performance of a high-end cooling loop without having to preplan or install it inside the case.

Dimensions: 19.9 x 8.3 x 19.9 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 2 x 3.5-inch internal, 4 x 2.5-inch internal



Rosewill Gungnir

\$64.99

www.rosewill.com

Why You'll Dig It: The Gungnir features a chamber in the bottom of the case where you'll install the power supply and HDDs. Rosewill separates the case's airflow between the top and bottom chambers to isolate heat from subsystem hardware. The shroud-like cover also helps to obscure cabling for a clean look. Rosewill includes three 120mm fans—two in the front panel, one in the rear—and the latter features a bright red LED to illuminate system internals. Both the top and front panels support radiators up to 280mm, so liquid cooling is certainly an option. For easy maintenance, the Gungnir includes dust filters on the front, top, and bottom panels. The case also features a fan-speed control switch on the top panel to let you manage cooling performance and system noise.

Who Should Apply: Enthusiasts who want a case that helps them to minimize cable visibility, as well as optimize cooling performance.

Dimensions: 17.3 x 8.3 x 18.6 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 2 x 5.25-inch external, 3 x 3.5-inch/2.5-inch internal, 2 x 2.5-inch internal



Deepcool Tristellar

\$399.99

www.deepcool.com

Why You'll Dig It: The Tristellar is a truly unique case. It features three independent component compartments, and Deepcool isolates the hottest hardware into separate cabins. In particular, the GPU is housed in a different compartment than the CPU and motherboard. You can install graphics cards up to 12.5-inches long, and the GPU connects to the motherboard through a riser card and cable that's run through the chassis to your motherboard's PCIe x16 slot. The compartment with the GPU can also hold up to three 2.5-inch storage devices. In the lower right compartment, you'll be able to install a Mini-ITX motherboard, as well as low-profile CPU cooler or closed-loop with a 120mm radiator. The last compartment is where you'll install the PSU and 3.5-inch hard drives.

Who Should Apply: Enthusiasts that want a case that makes a statement with its appearance, as much as it does with cooling performance.

Dimensions: 15.2 x 15.5 x 17.1 inches

Motherboard Support: Mini-ITX

Drive Bays: 2 x 3.5-inch internal, 3 x 2.5-inch internal



Rosewill Stryker M

\$59.99

www.rosewill.com

Why You'll Dig It: With support for up to six fans and 15.3-inch graphics cards, the Stryker M provides the necessary airflow and space to house a high-end gaming system. Rosewill includes two 120mm, blue LED fans in the front panel to pull in cool outside air, while the 120mm rear fan exhausts hot air. You can add up to two 120mm/140mm fans to the top panel, as well as one 120mm fan to the bottom panel. Both the top and front panels also support a 240mm radiator. To show off your build's internal components, there's also a clear side panel window. For storage, Rosewill provides a HDD bay that supports up to three 3.5-inch or 2.5-inch units, and there's also a 2.5-inch mount behind the motherboard tray. A magnetic dust filter above the top panel makes it easy to quickly remove any accumulated dust.

Who Should Apply: Power users who want a simple, yet highly effective mid-tower case.

Dimensions: 18.5 x 7.75 x 18.5 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 2 x 5.25-inch external, 3 x 3.5-inch internal,
1 x 2.5-inch internal



Aerocool GT-RS

\$79.99

www.aerocool.us

Why You'll Dig It: This cube-shaped case is split vertically down the middle to create two chambers. One side contains the power supply, optical drive, and storage devices, while everything else is in the other side chamber. The design separates several of the heat generating components in your build and allows the case to be small in height—while still accommodating an ATX motherboard and long graphics cards (up to 11.8-inches). Aerocool also inverts the motherboard 180 degrees, which puts your GPU front and center in the case's acrylic side-panel window, rather than your CPU heatsink and system memory. The front panel provides enough space to fit a 120mm or 240mm radiator. You can install up to five fans to maximize airflow.

Who Should Apply: Builders who want a tiny mid-tower case with a design that optimizes the cooling potential of your system.

Dimensions: 16.1 x 10.7 x 14.4 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 1 x 5.25-inch external, 1 x 3.5-inch external,
3 x 3.5-inch internal, 2 x 2.5-inch internal



Fractal Design Define Nano S

\$64.99/\$69.99 (Solid Panel/Window Panel)

www.fractal-design.com

Why You'll Dig It: It's a Mini-ITX case that can support a 240mm radiator in the top panel, as well as a 280mm radiator in the front panel. Being a small form factor case, there are some clearance caveats, such as that your memory modules can't be taller than 1.37 inches, but it's nearly unheard of that a Mini-ITX case will even support a 240mm radiator, let alone a 240mm and 280mm radiator. Fractal Design also pre-drills holes to mount brackets for custom reservoirs and pumps. The Define Nano S provides two expansion slots and can handle GPUs up to 13.1-inches long, though there will be less space if you install a radiator in the front panel. Somehow, Fractal Design also manages to support four storage devices. There are two dedicated SSD mounts, as well as two mounts that support either 2.5-inch or 3.5-inch storage devices.

Who Should Apply: Enthusiasts planning an exceptionally powerful small form factor system.

Dimensions: 13.5 x 8 x 16.2 inches

Motherboard Support: Mini-ITX

Drive Bays: 2 x 2.25-inch internal, 2 x 3.5-inch/2.5-inch internal



Aerocool Aero-1000

\$99.99

www.aerocool.us

Why You'll Dig It: We've reviewed every model in Aerocool's PGS-A case lineup, and all deliver exceptional value. The Aero-1000, for example, is only \$99.99 and provides a host of enthusiast features. A removable drive bay cage lets you extend maximum graphics card length from 11.4 inches to 16.4 inches. The top panel allows for up to 280mm radiators, and Aerocool recesses the panel, so you can install both a radiator and fans without having them hang over the motherboard tray. The front panel can also support a 280mm radiator that's up to 45mm thick. If big heatsink/fan coolers are more your thing, the Aero-1000 can handle those, too (a maximum height of 6.7 inches tall). The Aero-800 (\$79.99) and Aero-500 (\$69.99) are slightly smaller and slimmer than the Aero-1000, while still offering support for most of today's high-end components.

Who Should Apply: Those who need an affordable mid-tower case that supports today's biggest graphics cards and large radiators.

Dimensions: 19.7 x 8.3 x 19.6 inches

Motherboard Support: ATX, microATX, Mini-ITX

Drive Bays: 2 x 5.25-inch external, 5 x 3.5-inch internal, 2 x 2.5-inch internal



Case	MSRP	Motherboard Support	Internal Drive Bays	External Drive Bays	Max GPU Length (inches)	Fans (Preinstalled/Optional)	Dimensions (inches; HxWxD)
Deepcool Tristellar	\$399.99	Mini-ITX	2 x 3.5-inch 3 x 2.5-inch	none	12.5	1/1	15.2 x 15.5 x 17.1
Deepcool Genome	\$249.99	ATX microATX Mini-ITX	2 x 3.5-inch 4 x 2.5-inch	none	13	4/2	19.9 x 8.3 x 20
be quiet! Silent Base 800	\$149.90 (window) \$139.90 (no window)	ATX microATX Mini-ITX	7 x 3.5-inch 4 x 2.5-inch	3 x 5.25-inch	15.7	3/4	22 x 10.5 x 19.5
Cooler Master MasterCase Pro 5	\$139.99	ATX microATX Mini-ITX	5 x 3.5-/2.5-inch 4 x 2.5-inch	2 x 5.25-inch	16.2	3/3	20.2 x 9.25 x 21.6
be quiet! Silent Base 600	\$119.90 (window) \$109.90 (no window)	ATX microATX Mini-ITX	3 x 3.5-inch 3 x 2.5-inch	3 x 5.25-inch	16.2	2/5	19.4 x 9.1 x 19.5
Cooler Master MasterCase 5	\$109.99	ATX microATX Mini-ITX	2 x 3.5-/2.5-inch 4 x 2.5-inch	2 x 5.25-inch	16.2	2/4	20.2 x 9.25 x 21.6
Aerocool Aero-1000	\$99.99	ATX microATX Mini-ITX	5 x 3.5-inch 2 x 2.5-inch	2 x 5.25-inch	16.4	3/2	19.7 x 8.3 x 19.6
Fractal Design Define S	\$89.99 (window) \$79.99 (no window)	ATX microATX Mini-ITX	3 x 3.5-/2.5-inch 2 x 2.5-inch	none	17.7	2/7	17.8 x 9.2 x 20.5
Aerocool GT-RS	\$79.99	ATX microATX Mini-ITX	3 x 3.5-inch 2 x 2.5-inch	1 x 5.25-inch 1 x 3.5-inch	11.8	1/4	16.1 x 10.7 x 14.4
Fractal Design Define Nano S	\$69.99 (window) \$64.99 (no window)	Mini-ITX	2 x 3.5-/2.5-inch 2 x 2.5-inch	none	13.1	2/4	13.5 x 8 x 16.2
Rosewill Gungnir	\$64.99	ATX microATX Mini-ITX	3 x 3.5-/2.5-inch 2 x 2.5-inch	2 x 5.25-inch	15.7	3/2	17.3 x 8.3 x 18.6
Rosewill Stryker M	\$59.99	ATX microATX Mini-ITX	3 x 3.5-inch 1 x 2.5-inch	2 x 5.25-inch	15.3	3/3	18.5 x 7.75 x 18.5

Sync Your Game Saves To The Cloud

For gamers, the most useful feature to come along in the past few years isn't DirectX 12, lifelike hair effects, or even real-time physics; it's cloud-based game saves. With this feature, you can play your games on your main PC, switch to your HTPC, and even log in to your accounts on another PC and have your progress from each session carry over to the next. Cloud saves are one of the most popular features of online game stores and platforms, including Steam, Origin, and Uplay, and now even consoles such as the PS4 and Xbox One support them. In addition to keeping your progress synced between multiple systems, cloud saves can also save your bacon if you encounter a catastrophic storage drive failure or a corrupted file forces you to reinstall the game. Once you're back up and running again, your saves automatically download to their respective folders, ready for you to get back at it, almost like magic.

There's one glaring problem with this feature, however: It's not supported by every game. After a quick perusal of our Steam library, we found that 69 of the 150 games didn't support Steam Cloud, and we're not just talking about indie games or games developed before the word "cloud" was used to describe anything other than water vapor in the sky. Just Cause 3, Grand Theft Auto V, Rust, Call of Duty: Black Ops III, Assassin's Creed Syndicate, Street Fighter V, Tom Clancy's Rainbow Six Siege, and Far Cry 4 are just a handful of the thousands of titles that don't support Steam Cloud.

Some games that support the feature have inadvertently corrupted users' save files, leading many to swear off the feature. Plus, there are online game stores where the feature isn't supported at all, so even if the developer intended to support cloud saves, the platform won't. For instance, The Witcher 3: Wild Hunt on Steam supports cloud saves, but on GOG, it does not.

In addition to keeping your progress synced between multiple systems, cloud saves can also save your bacon if you encounter a catastrophic storage drive failure or a corrupted file forces you to reinstall the game.

For any of the games or situations listed above, users who want to continue their progress using a different PC need to manually share the game saves via email, a flash drive, or a third-party cloud storage service and then copy them to the saves folder on the new PC. This month, we'll show you how to set-and-forget an automatic cloud-based game-saving scheme for all your games.

Symbolic Links

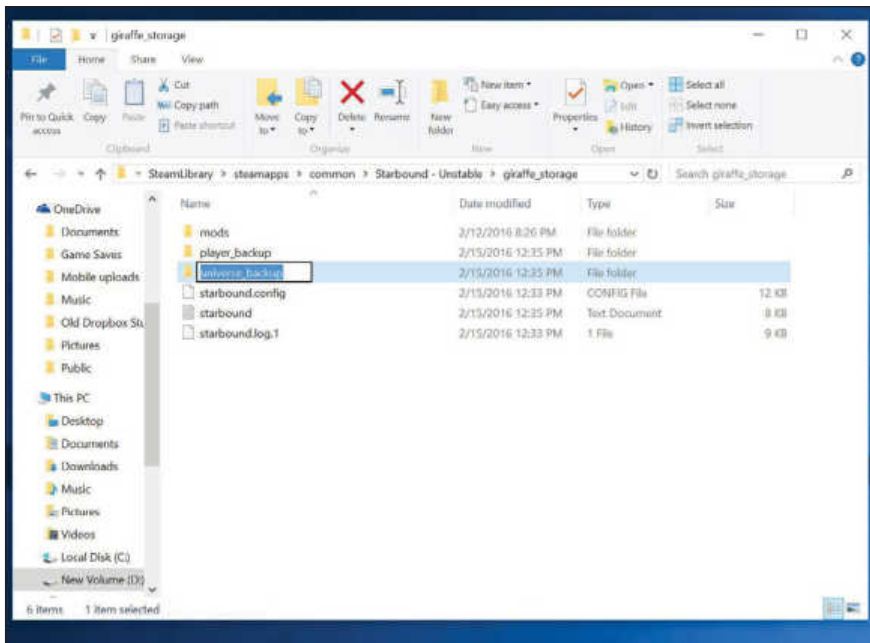
The technical term for what we'll be doing in this tutorial is creating symbolic links inside a third-party cloud storage service folder. These links effectively let a folder exist in two locations at once. We need to locate the game save folder, which is different for every game you own, and give it a secondary location inside the cloud service's sync folder. Then, on each successive system you plan to play on, you'll need to create another symbolic link to establish the two-way file

exchange. It sounds more complicated than it is, so let's dive in.

Pick A Cloud, Any Cloud

There are a ton of cloud services available that will work for this purpose, including Microsoft OneDrive, Box, Dropbox, SugarSync, Amazon Cloud Drive, Google Drive, and more, all offering a handful of gigabytes of free storage for whatever you want. For the most part, this procedure will work for any service that offers to sync one or more folders on your PC.

If you don't already have an account with a cloud storage provider, you'll need to create one. Start by visiting the provider's website, downloading the application, and creating an account. For this tutorial, we tested it to work with Dropbox (www.dropbox.com) and Microsoft OneDrive (www.onedrive.live.com). If you're new to the services, you will get 5GB with OneDrive and 2GB with a Dropbox basic account.



This procedure carries with it a chance of wiping the contents of the folder, so always make sure to back up your game saves.

Once everything is set up, create a new folder in Dropbox or OneDrive to which we'll copy the game saves. Navigate to C:\USERS\<USERNAME>\ONEDRIVE, C:\USERS\<USERNAME>\DROPBOX, or the path you chose when setting up your cloud service. Right-click in the folder and click New, Folder. Name the folder GAME SAVES.

Find Your Game Saves

The next step, finding out where each of your game save files are stored, can sometimes be the trickiest. That's because there's no standard location for storing them. Common locations include C:\USERS\<USERNAME>\SAVED GAMES, C:\USERS\<USERNAME>\DOCUMENTS, C:\USERS\<USERNAME>\DOCUMENTS\MY GAMES, C:\USERS\<USERNAME>\APPDATA\ROAMING, C:\USERS\<USERNAME>\APPDATA\LOCAL, C:\PROGRAM FILES (X86)\, C:\PROGRAMDATA\, C:\PROGRAM FILES (X86)\STEAM\STEAMAPPS\COMMON\, C:\PROGRAM FILES (X86)\UBISOFT\UBISOFT GAME LAUNCHER\SAVEGAMES, and the list

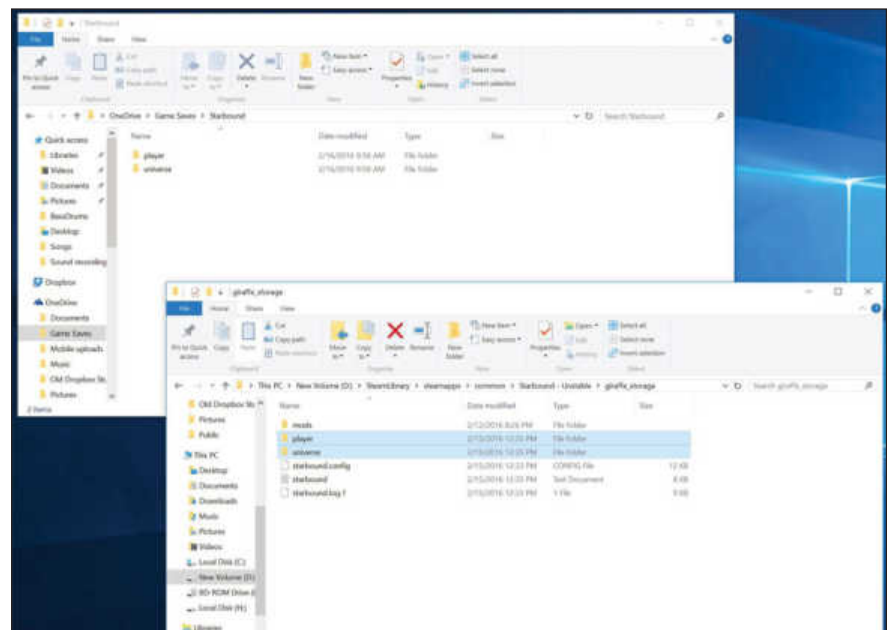
goes on. The saves are usually in a folder that bears the name of the game.

The <USERNAME>\DOCUMENTS and <USERNAME>\DOCUMENTS\MY GAMES folders are two of the most commonly used locations, so checking there

will often be your best bet. If the game save files are not there, look up the game on the PC Gaming Wiki (pcgamingwiki.com/wiki) and scroll to the Save Game Data Location entry. For instance, The Witcher 3: Wild Hunt game saves are in <USERNAME>\DOCUMENTS\THE WITCHER 3\GAMESAVES.

Starbound Goes Cloudbound

The game we're using for this tutorial is Starbound, a game that stores its save files in the same folder in which the game is installed, and one that doesn't natively support Steam Cloud. To access Starbound's save files, we need to launch File Explorer and navigate to the C:\PROGRAM FILES (X86)\STEAM\STEAMAPPS\COMMON\STARBOUND\GIRAFFE_STORAGE folder, which should be where you'll find the files if you let Steam install the game in its default location. If you have this game and/or others installed on an alternative drive, look in D:\STEAMLIBRARY\STEAMAPPS\COMMON\STARBOUND\GIRAFFE_STORAGE, substituting the "D:\" for the drive letter of your alternate game storage device. The last folder in that path named GIRAFFE_STORAGE actually refers to the version



Creating symbolic links is the key to making your own cloud game saves.

TIP OF THE MONTH:

Game Save Utilities

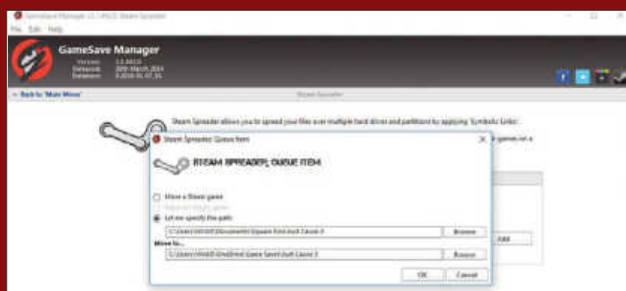
The method described in this article works well, but if you'd rather not jump through the requisite hoops, you'll be glad to hear that there are a handful of utilities that'll manage your game saves for you, with minimal effort. And better yet, they're free. Here's a look at two:

GameSave Manager

To download InsaneMatt's GameSave Manager (freeware), visit www.gamesave-manager.com, click the Download tab, then click the Download button on the next page. This one comes as a .ZIP file, so extract it, open the folder, and double-click the Gs_mngr application to launch the install. We clicked Yes when asked to allow the utility to enable administrative rights to perform its functions, clicked Yes on the UAC warning, left the settings at their defaults, and clicked OK to complete the install.

While the application continues to set up, it'll scan your system for game saves before the utility displays its menu of main functions. There are hyperlinks for backing up game saves, restoring them, customizing settings, and viewing logs. But the function we're looking for is the Steam Spreader. This lets you move directories to another location and create a symbolic link between the two locations. Sound familiar?

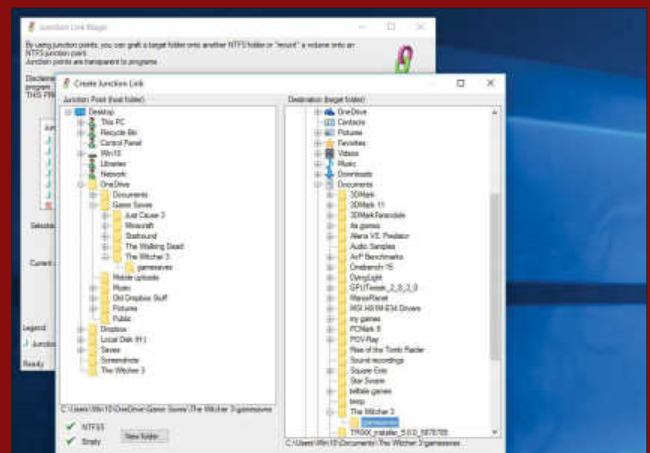
After clicking the Steam Spreader link, you'll find an empty Move Directories box. When you click Add, you can select radio buttons to display game directories that the utility detected from Origin and Steam or opt to manually specify a directory. The JUST CAUSE 3 directory, although a Steam game, wasn't detected, so we clicked the third radio button to find it ourselves, then navigated to C:\USERS\<USERNAME>\DOCUMENTS\SQUARE ENIX\JUST CAUSE 3 and clicked OK. Next, we clicked the Browse button from the Move To field, navigated to the JUST CAUSE 3 folder we created in OneDrive, and clicked OK. Finally, we clicked Move to create the symbolic links. After installing the utility on a secondary PC and creating the new symbolic link, we quickly verified that it works. GameSave Manager is easy to use and performed admirably.



GameSave Manager cuts the Command Prompt out of the symbolic link-generating equation.

Junction Link Magic

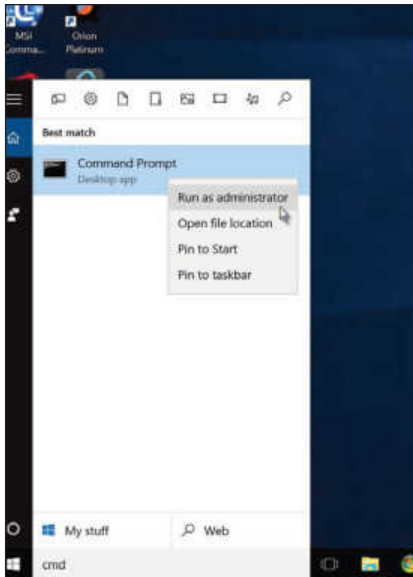
Junction Link Magic is another freeware utility that attempts to make symbolic links a no-brainer. You can download it from www.rekenwonder.com/linkmagic.htm. After installing the utility and launching it, you'll have the option to run a scan of your system to locate existing junction points. These aren't necessary for our purposes, so you can ignore them for now.



Junction Link Magic simplifies the creation of junction links, which are very similar to symbolic links.

From the main menu, we clicked Create to open the Create Junction Link window. The left pane is where the host folder needs to be and the pane on the right is where we'll locate the target folder. The best way to use a junction link with this utility is to make the game's default save location the host and turn the cloud storage folder, such as OneDrive or Dropbox, into the target folder. To do this, we first need to empty the game's default save location, so we navigated to THE WITCHER 3\GAMESAVES, copied the contents of the folder, and pasted it into a new THE WITCHER 3\GAMESAVES folder we created in OneDrive. Junction Link Magic requires that the host folder be empty before creating a link, which is why we had to perform this file swap to continue. Now, back in the utility, we can navigate to the C:\USERS\<USERNAME>\DOCUMENTS\THE WITCHER 3\GAMESAVES folder from the left pane and then navigate to OneDrive's version of that folder in the right pane. Finally, we clicked Create to make the link. With this step out of the way, we went to our secondary PC and performed the same steps, making sure to designate the game's default save folder as the host and making sure it's empty before we attempt to create the junction link.

The big difference between junction links and symbolic links is that the former only works with directories, whereas symbolic links can exist as individual files. This utility works well, and the UI is fairly straightforward. We have no problem recommending this utility to those looking to avoid messing around with the Command Prompt.



You'll need to launch the Command Prompt as an administrator to continue.

of Starbound you're running, and when the game updates next, it'll likely change, potentially forcing you to alter your symbolic link, but let's not get ahead of ourselves.

Starbound has a handful of save file types stored in two different subfolders within the GIRAFFE_STORAGE folder, the first of which saves your character and shipworld, and the second stores the universe and everything you've constructed and looted from the various planets you visit. There's a third folder in the STARBOUND folder for mods; you can ignore this folder for now. Highlight the PLAYER and UNIVERSE folders, right-click them, and click Copy.

Next, go to your GAME SAVES folder in OneDrive or Dropbox, create a subfolder for Starbound, open that folder, right-click in the empty space, and click Paste to deposit copies of the folders here.

Now we can rename the folders in the STARBOUND game directory so that new saves aren't deposited there. We like renaming these folders instead of deleting them (also a viable option), as it gives us a nice little backup location should our cloud plans go up in a puff of smoke. To proceed, we right-clicked the PLAYER and UNIVERSE folders, clicked Rename, and typed **PLAYER_BACKUP** and **UNIVERSE_BACKUP** for both folders, respectively.

Create The Symbolic Link

This is where the magic happens. Start by opening a Command Prompt by clicking Start, typing **cmd**, and then right-clicking Command Prompt from the search window and clicking Run As Administrator. In the Command Prompt window, we'll be using the **mklink** command with the **/d** parameter, which lets us create a symbolic link for a directory; **mklink** by itself merely creates a symbolic link for a single file.

In the Command Prompt window, type **mklink /D "D:\STEAMLIBRARY\STEAMAPPS\COMMON\STARBOUND\GIRAFFE_STORAGE\PLAYER" "C:\USERS\<USERNAME>\ONEDRIVE\GAME SAVES\STARBOUND\PLAYER"** and then press ENTER. The first path in quotes needs to point to the original save directory, and the second path needs to refer to your new location in Dropbox or OneDrive. Be sure to substitute your PC's username where applicable. Next, do the same for the universe directory. Type **mklink /D "D:\STEAMLIBRARY\STEAMAPPS\COMMON\STARBOUND\GIRAFFE_STORAGE\UNIVERSE" "C:\USERS**

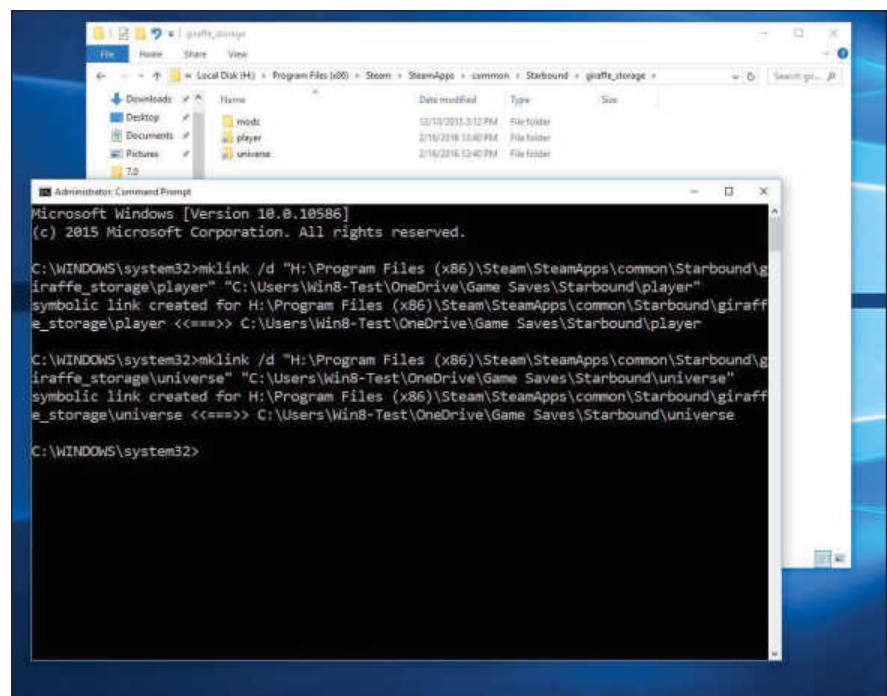
<USERNAME>\ONEDRIVE\GAME SAVES\STARBOUND\UNIVERSE" and press ENTER. To make sure it worked, return to the original save location where you'll find the UNIVERSE and PLAYER folders have returned, but now they sport shortcut icons.

On Your Other PCs...

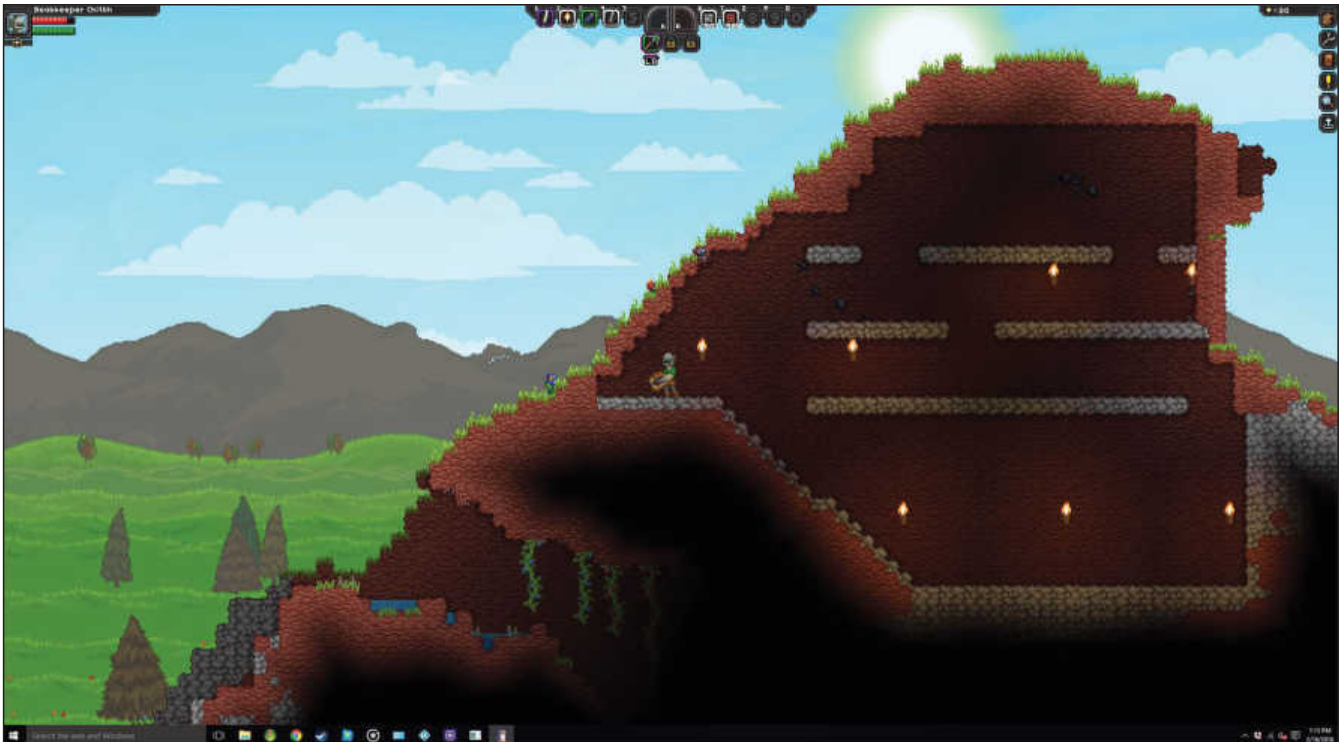
So far, we've made the game saves for Starbound available to any PC where we set up a Dropbox or OneDrive account, but it won't automatically load when we launch the game on our other PCs, nor will any progress we make in the game sync over. To get this to work, we need to perform the same functions as before.

Start by making sure you have OneDrive or Dropbox installed on this secondary PC and then sign in. If you're just now setting up the cloud account on this PC, it's a good idea to make sure there's plenty of storage capacity on the drive where you plan to install OneDrive or Dropbox, at least enough to duplicate everything you have stored in the cloud.

We already know where the game saves are, so navigate to the directory and delete



This is what our completed symbolic link commands look like in the Command Prompt window.



With our symbolic links in place, we can pick up where we left off on virtually any PC.

the PLAYER and UNIVERSE folders, if they're there (making sure that these saves are older than the saves you'll be syncing over from the cloud). There's no need to keep backups of the saves here.

Next, start an elevated Command Prompt session as before, then type the symbolic link command as before, changing only the paths in quotes, as they may be

different. For us, the first command looked like this: `mklink /D "H:\PROGRAM FILES (X86)\STEAM\ STEAMAPPS\ COMMON\STARBOUND\GIRAFFE_ STORAGE\PLAYER" "C:\USERS\ <USERNAME>\ONEDRIVE\GAME SAVES\STARBOUND\PLAYER"`

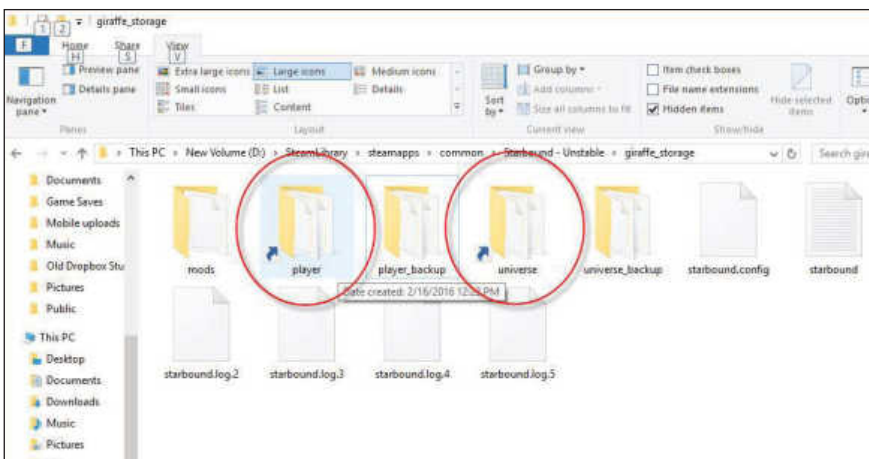
Press Enter to input the command and create the symbolic link. Next, we need to

do the same for the universe folder. We can do this easily by duplicating the command we just entered by pressing the Up arrow key, then just using the arrow keys to replace "player" with "universe." Our new command looks like this: `mklink /D "H:\PROGRAM FILES (X86)\STEAM\ STEAMAPPS\ COMMON\STARBOUND\GIRAFFE_ STORAGE\UNIVERSE" "C:\USERS\ <USERNAME>\ONEDRIVE\GAME SAVES\STARBOUND\UNIVERSE"`

Again, make sure to substitute your PC's username where applicable, and then press ENTER to complete the symbolic link command. As before, you can check to make sure it worked by visiting the original save location and checking for shortcut icons.

Another First-World Problem, Solved

A DIY cloud save scheme isn't a problem most people who game on a single PC encounter, but if you find yourself switching between two or more systems on a regular basis, this procedure is easy to perform and it eliminates the tediousness of having to manually juggle save files. Best of all, you don't need to insert a coin to continue. ■



You know the procedure worked when you see shortcut icons in place of the folder icons.

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Upgrades That'll Keep You Humming Along

It's a little of this, a little of that for this month's gang of software updates. We have updates for apps that every power user should have, such as Process Lasso and HWiNFO, plus a handful of other very useful programs. As usual, NVIDIA keeps doing its thing, releasing another driver for its GeForce graphics cards.

SOFTWARE UPDATES

Bitsum Process Lasso 8.9.6.8

Nothing whips your system's unruly processes into shape quite like Bitsum's Process Lasso. Naturally, a program designed to lighten the load on the CPU isn't going to be resource-intensive to begin with, but the latest update makes the software even more efficient in terms of its CPU utilization. Version 8.9.6.8 should also be more agreeable with security software and "tamper-resistant" processes.

<https://bitsum.com>

Cloudfogger For Windows 1.5.33

Cloud storage is great, but if you're not wild about Dropbox, Google, Microsoft, etc. taking a peek at your files, you might want to encrypt them before beaming them up. Cloudfogger does the trick rather nicely, and now it fogs faster than ever. Version 1.5.33 introduces "significant" performance improvements according to the Cloudfogger team, especially if you encrypt a huge batch of files using the software's Auto-Fogg function. This update also irons out a few minor wrinkles, including a bug that listed files at 0 bytes (even though the files themselves were fine) and another issue with Cloudfogger's Windows Explorer context menu extension.

<https://www.cloudfogger.com>

Rogue Amoeba Software Airfoil For Windows 5.0.1

You didn't grow your collection of digital music into the terabytes just to be forced to play it on a single PC. Rogue Amoeba Software's Airfoil can blast your tunes almost

anywhere in the house, whether that's an Apple TV, iOS and Android devices, or another computer. It also lets you stream audio from Spotify and Pandora, as well as any web-based audio. Version 5.0.1 fixes a handful of critical bugs, but the 5.0.0 release is the real headliner. Airfoil for Windows 5.0.0 makes the software compatible with thousands of Bluetooth speakers and headphones, and it also now works with the Airfoil Satellite companion app. It also features an ultra-sharp new UI.

<https://www.rogueamoeba.com/airfoil>

Registry Finder 2.9.1

It's not often that two updates for one program are released on the same day, but that's the case with Registry Finder. Technically, version 2.9.1 is the latest release, but think of it more as a postscript to version 2.9. In fact, all it does is fix a crash bug related to the big feature introduced in version 2.9: the ability to search for Registry keys that were modified within a specified date range. As it turns out, not specifying a date range caused Registry Finder to go down in flames; version 2.9.1 patches the issue. Otherwise, version 2.9 fixes a pair of additional bugs.

registry-finder.com

Willow Software Anvil Studio 2016.02.04

Digital composers can do a lot with Anvil Studio, and now the MIDI and audio editor is even better. In early February, Willow Software released version 2016.02.04, which makes improvements to the software's menus and fixes a few bugs. In a separate early

February update, Willow added a pair of new features that gives users more flexibility when working with notes in a particular track. Version 2016.02.01 also fixes one bug that caused some 8th/16th notes to be drawn without a stem and another bug that potentially stopped recording Control Change events from external MIDI devices.

www.anvilstudio.com

HWiNFO 5.20

HWiNFO tells you more about your rig's components than you could possibly want to know, and then it tells you a little more. Maybe that's hyperbole to the most exacting of power users, but the software is very, very thorough. In version 5.20, SSDs receive a lot of attention. The update extends NVMe S.M.A.R.T. and makes a few changes for select SSDs. Specifically, monitoring of total/NAND reads and writes for some SanDisk drives should be better, and HWiNFO now supports Samsung SSD 950 Pro drives that use the default Microsoft NVMe driver. Preliminary support for AMD Ellesmere, Baffin, and Greenland GPUs are rolled into the update, too.

www.hwinfo.com

DRIVER BAY

NVIDIA GeForce Game Ready Driver 361.91

The most current driver for NVIDIA's GeForce graphics cards adds a handful of new SLI profiles for several games, including Assassin's Creed Syndicate, XCOM 2, and Plants vs. Zombies: Garden Warfare 2.

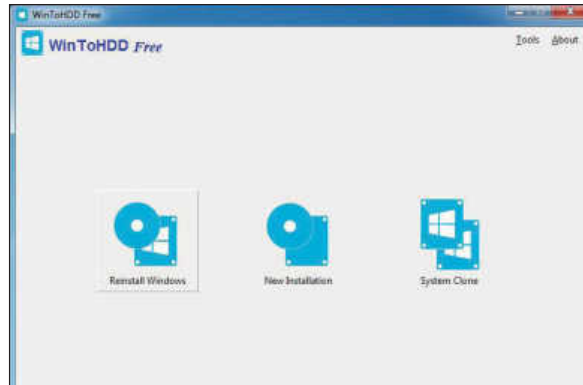
www.nvidia.com

Inside The World Of Betas

THE EASYUEFI DEVELOPMENT TEAM WINTOHDD 1.0 BETA

Optical drives have been on death's door for quite some time now. With the prevalence of digital distribution, usually the only time we need an optical drive for a game, music album, or movie are those quaint moments when an out-of-touch family member gifts us one. Some users have held onto their ODDs in order to have an easy, if time-consuming, option for installing Windows, but over the years a number of apps have made it much easier to ditch the installation disc. WinToHDD, an offering from The EasyUEFI Development Team, is one such app.

The EasyUEFI Development Team already has a similar program, WinToUSB, in its stable, so they already know a thing or two about shuffling Windows to alternate media. There's nothing particularly demanding about WinToHDD's requirements—at least 512MB of RAM



and 500 megs of disk space will do the trick—and the software can handle Win10 in addition to Vista/7/8/8.1.

Using WinToHDD is embarrassingly simple. The software's UI presents you with three options: Reinstall Windows, New Installation, and System Clone. The first two options use an ISO file to either, well, reinstall Windows or put a fresh copy

on a blank hard drive. The final option mirrors your current Windows installation to another HDD (which takes some time, so grab lunch, watch Netflix, etc.)

WinToHDD doesn't have a lot of tricks, but it performs the tricks it does know very well, which is what good software does. If you're constantly shuffling Windows installations around, check this app out. ■

WinToHDD 1.0 Beta

Publisher and URL: The EasyUEFI Development Team; www.easyuefi.com

ETA: TBD

Why You Should Care:

Dumping Windows on a drive is easier than ever with this tool.

FUTUREMARK 3DMARK HOLIDAY BETA

Futuremark's 3DMark benchmarking software has been a staple of the power user community for nearly a decade. Whether you use it to make sure your hardware is performing the way it should or if you're simply in pursuit of a top score for bragging rights, 3DMark serves a lot of purposes beyond letting you gawk at a parade of pretty 3D demos. With the release of the 3DMark Holiday Beta, Futuremark gives us something special: the ability to gawk at a parade of 3D demos . . . in virtual reality.

The beta, which is available to existing 3DMark users, offers a taste of Futuremark's upcoming VRMark. Specifically, the beta gives VR headset owners the chance to watch—and even move within—four “classic 3DMark scenes.” Futuremark has a knack for stunning visuals, so the ability to immerse yourself in them is definitely a fun novelty.



But the holiday beta is a lot more than virtual fun and games, as it offers all enthusiasts, whether they have a VR HMD (head-mounted display) or not, a sneak peek at the upcoming 3DMark. At center stage is a brand-new UI with a Home screen that presents each user with the recommended benchmark for their system. (Of course, you can

install and run any of the benchmarks in 3DMark's suite.)

Another welcome change the beta brings is breaking up the benchmark into separate, independently downloadable benchmarks. The ability to pick and choose benchmarks, rather than downloading a single monolithic file, is long overdue. Get the beta and look around, virtually. ■

3DMark Holiday Beta

Publisher and URL: Futuremark; www.futuremark.com

ETA: 1H 2016

Why You Should Care:

Experience 3DMark in VR.

The Office Of 2016

Remote Workers Use Tele-robots To Gain A Presence

Remote working isn't just a workplace approach more companies (including Fortune 500 ones) are supporting. It's also an arrangement that research, experts, and executives alike indicate holds numerous potential benefits for everyone involved. Thus, even as Yahoo and other companies have changed policies in recent years to pull remote workers back into the office, others are letting employees work from the office and elsewhere, even on a full-time basis.

An evolving workforce is driving many companies to adopt remote working. Because there are more developer, programmer, data scientist, and other tech-related positions available among companies than the workforce can fill, those with such skills find themselves with increasingly more bargaining power to dictate where they will and won't work. Research also shows younger professionals are increasingly fine working as freelancers and consultants and willing to explore entrepreneurial options to secure the work lifestyle they desire.

Traditionally, remote working has meant using email; chat; videoconferencing; and other communication, collaboration, and telepresence tools to connect with in-office workers. Although these work, some remote workers say what they don't do is help them establish an ongoing "presence" in the office or help them feel truly engaged in office culture. Enter the telepresence robot, or "tele-robot," "iPad on a Segway," or "Skype on wheels."

Like telepresence systems, tele-robots essentially let a user be in two places at once. Tele-robots, though, add an element of mobility that broadens what a remote user can see, hear, and interact with in the office. Wendell Chun, principal analyst at Tractica, hails tele-robots as the next evolution in telepresence systems,

describing them as "a smart computer on wheels" that users can control remotely and project "senses in a cognitive way." Long-term, he expects tele-robots will become more pervasive as hardware and Internet costs continue to decline.

Though tele-robots have been available for office use for years, they seem to be

is that generally easy access to Internet connectivity and communication/collaboration tools means employees can now perform a wide swath of jobs out of the office. Research shows it's middle-aged, college-educated, salaried employees with higher incomes at companies with 100-plus employees who most commonly work



Compared to what other telepresence tools can provide, tele-robots are gaining praise for the ability they give remote workers to have a more engaging presence in areas throughout the office.

gaining traction of late, particularly with tech-driven firms known to embrace new technologies. Tele-robot manufacturers are also pushing tele-robot use in health care, tourism, education, and other industries. Still, skeptics question whether tele-robots are even necessary, especially given the tools already available. Everyone, however, seems to agree that tele-robots are definitely cool and possess all kinds of potential. The following focuses on how remote workers and companies are using them.

Remote Working In 2016

To understand why a company would even consider a tele-robot, it helps to know why companies are allowing remote working in the first place. The reality

remotely. Research also indicates remote workers typically work longer hours; perform better in certain business aspects; are less likely to quit; are less stressed; and are more highly engaged, alert, attentive, productive, profitable, and happy.

GlobalWorkplaceAnalytics.com states a typical business can save \$11,000 per employee annually by allowing remote working even half the time. Nationally, this could mean an economic benefit totaling more than \$700 billion annually. Savings would stem from reductions in employee turnover (14% of U.S. workers have changed jobs to eliminate a commute); absenteeism (78% of people phoning in sick aren't); and company real estate, electricity, travel, and compliance

expenses. Remote working can also benefit companies in times of disaster. The U.S. General Services Administration, for example, reportedly positioned itself so that all but 200 of its 3,800 staff members had the ability to work remotely during the recent blizzard that closed federal offices in Washington, D.C.

On average, 2015 Gallup research shows U.S. workers work from home about two days monthly. GlobalWorkplaceAnalytics.com states 50% of the U.S. workforce has jobs compatible with part-time teleworking, and 37% would take a 10% pay cut to work from home. FlexJobs, which offers services to flexible job seekers, states it saw a 26% increase in remote job listings from 2013 to 2014.

Experts warn companies should heed such data, particularly where it concerns the younger, tech-savvy workers they're

increasingly recruiting. An AfterCollege survey, for example, found that 68% of job seekers polled who were millennials said working remotely would increase their interest in an employer. Susan Eustis, president of Wintergreen Research, says because the younger workers companies consider valuable are willing to jump to companies that support the flexible lifestyle they're after, managers are having to adapt to retain them.

Rob Bamforth, a Quocirca principal analyst focusing on business communications, says younger workers also tend to view social media and enabling sharing and collaboration in the broadest sense. Thus, being connected to colleagues and co-workers becomes more important to them. "This is a positive development for remote working, as isolation and loss of camaraderie and

corporate culture have often been cited as problems for tele-workers and the organizations they work for," he says.

The Office Robot

Historically, remote workers have combined periodic trips to corporate headquarters with communication and collaboration tools to keep pace with in-office colleagues. No matter how good the tools, though, some remote workers (especially full-time ones) report feeling isolated, being "out of sight, out of mind," and having a "fear of missing out" on key developments, conversations, brainstorming sessions, and even promotions. In other words, the tools can't easily enable the impromptu and often beneficial conversations that happen with co-workers in hallways, at water coolers, in breakrooms, or at employees' desks.

Such flexibility and mobility is precisely what a Wi-Fi or 4G-enabled tele-robot can provide by combining a display or tablet with video and audio capabilities with a wheeled base the remote worker controls via keyboard or mouse after logging in to a Web or mobile app. While the remote worker takes in live audio and video streams the tele-robot captures from the office, she broadcasts her own presence back to co-workers. Imagine a company owner who, rather than flying to his overseas factory several times a month, instead uses a tele-robot to roam factory floors to check in whenever he wants.

"Increased engagement is one thing, but there can also be strong value in problem-solving or improving process efficiencies when an expert or a manager can 'walk along' and see the operations and the problems, essentially firsthand," says Barbara Kraus, Park Associates director of research, connected CE and platforms.

Chun says although tele-robots have been used for research purposes for decades, there's been a recent explosion of new, commercial tele-robots that incorporate high-quality visual and audio sensors on the robot and at the operator's control station. High bandwidth and mobile connectivity are also driving adoption, he says. Long-term, Tractica

Through These Store Doors Waits No One

Set your coordinates to 425 University Ave., Palo Alto, Calif., in Silicon Valley, and you'll find a retail store unlike any you've likely encountered. That's because the Beam store, which Sutable Technologies opened in late 2014, is completely unmanned. The only salespersons onsite take the form of telepresence robots the employees log in to and control remotely from New York, Hawaii, Sidney, and other locations.

The Beam store intentionally operates this way to give people interested in tele-robots a firsthand experience with Sutable Technologies' Smart Presence System via its BeamPro and Beam+ models. The company's blog states that although its robots can do amazing things, not everyone has access to experience them. The Beam store grants such access. Even if you're unable to visit the store physically, you can schedule a test drive remotely.

In case you're curious, the Beam store employees remotely lock and unlock the store's doors and control the lighting and temperature. One Beam Store manager reportedly has gone as far as strolling his Beam robot self to a nearby ice cream shop to fetch a couple scoops for Facebook Co-founder Mark Zuckerberg.



The Beam store, which Sutable Technologies opened in Silicon Valley, has no actual salespersons on location. Instead, employees log in to onsite tele-robots from various locations.



Although the Revolve Robotics Kubi telepresence system doesn't have wheels, the base unit does enable users to tilt, rotate, raise, and lower the display to see more and to engage with others more directly.



One selling point of tele-robots such as this Beam model from Sutable Technologies is that their mobility enables remote workers to communicate with co-workers beyond the constraints of traditional videoconferencing.

forecasts the tele-robot market to expand from 4,200 units in 2015 to annual shipments of 31,600 by 2020, a 49.7% CAGR. Cumulative shipments for the period are forecast to hit 92,000. Tractica sees two business models for tele-robots: rentals of high-priced units and purchases of more affordable, basic units.

Key to growth, Chun says, is having tele-robots function seamlessly and properly at all times, meaning no connectivity dropouts and providing high-quality video, clear audio with noise cancellation, obstacle avoidance, adequate battery life, and intuitive user interfaces. "Once trying the technology, its advantages are obvious," says Chun, who reasons that as more companies expand globally, demands to connect engineering with manufacturing and distribution and sales will increase. Tele-robots could alleviate the pains of uniting team members across long distances.

Currently, Eustis says traditional videoconferencing remains an essential tool for tele-workers, but scheduling calls or asking someone to configure a laptop to chat "is a hassle." Adding robotic abilities to telepresence "brings enormous flexibility to the communications task," she says. Eustis foresees the remote aspect becoming almost invisible as workers get accustomed to working this way. Ultimately, tele-robotics could extend to platform technologies that enable performing remote hands-on operations, she says. "Telepresence robots will surely decrease the cost of telepresence systems," Eustis says. "They'll enhance the value of telepresence by creating the opportunity for more versatile communications scenarios."

Marcus Rosenthal, CEO of Revolve Robotics, maker of the Kubi tele-robotic system, says businesses are using tele-robots in team-desk clusters to give remote workers a presence, in conference rooms as hybrid meetings, in executive briefing centers, and for corporate training. He says the Kubi enhances the engagement and interaction of videoconferencing to the extent that interacting remotely becomes comparable to being there in person. "We see

Face-To-Face Meetings That Matter

The White House offered an example of how effective and appropriate it can be to use a telepresence robot to help people from all walks of life access environments they otherwise might find difficult, if not impossible.

In July 2015, Alice Wong, founder and project coordinator for the Disability Visibility Project, attended a reception in the Blue Room at 1600 Pennsylvania Ave. that marked the 25th anniversary of the Americans with Disabilities Act. Wong did so with the assistance of a BeamPro tele-robot. Beyond meeting and speaking with President Barack Obama via her tele-robot self, Wong met with Vice President Joe Biden and other officials using the BeamPro's streaming video and audio and mobility abilities.

According to the Disability Visibility Project, Wong is the first person to use a telepresence robot in the White House. Considering the potential a tele-robot has to, say, enable foreign leaders and dignitaries to attend key events when time and circumstances make doing so otherwise challenging, it's definitely not inconceivable Wong won't be the last person to make such a visit.



Alice Wong of the Disability Visibility Project attended a celebration at the White House using a tele-robot, making her the first person to ever visit the White House in such a way.

organization-wide deployments expanding as the telepresence robots get designed into the company workflows," he says. As such, Revolve Robotics has integrated videoconferencing applications into the Kubi system and plans to integrate full-blown videoconferencing platforms soon.

Outside of offices, others are finding a purpose for tele-robots, including to attend conferences and tradeshows. Imagine roaming PAX Prime with a tele-robot, for example, and seeing and speaking in real-time with attendees face to face. Others are using tele-robots to regularly check in on elderly grandparents still living at home and to enable people, including those with disabilities, to tour museums. Educationally, a student stuck at home due to injury or illness could still interact with classmates, while a teaching specialist could provide services to rural schools otherwise difficult to reach. College coaches and academic recruiters reportedly are using tele-robots to give key recruits tours of university facilities, while physicians are using them to enhance patient consultations. Eustis sees tele-robots as the most promising of all the communications robots. "I believe they will find a use in every industry segment, including healthcare where so much of the communication is via smartphone," she says.

At about \$500, Rosenthal says the Kubi makes it easy to deploy telepresence across an organization to let remote employees "literally teleport from location to location almost instantly." And by integrating leading videoconferencing tools, he says, the Kubi creates interactive telepresence experiences that stretch beyond the conference room.

The Robot-Employee Relationship

Besides the Kubi, examples of tele-robots suitable for remote workers in office settings include Sutable Technologies Beam+ and Beam Pro units (about \$2,000 and \$17,000 for homes and enterprises, respectively) and Double Robotics Double 2 (about \$2,500), which improves upon the original Double's speed, stability, and other abilities.

The Double 2 essentially looks like an iPad (not included) on a remotely adjustable poll (47 to 59 inches) that's connected to a Segway-looking base that incorporates lateral stability control via an "absorption mechanism" to help maneuver cords, bumps, and other obstacles. The iPad and Double 2 connect via Bluetooth. An optional Camera Kit, meanwhile, provides a 5MP camera with 150-degree wide-angle lens for a 70% viewing field right and left. The Double 2's battery is rated for about eight to 10

hours and recharges via a docking station it parks on.

The Sutable Technologies Beam models also use a charging dock. Instead of a poll, though, the Beam models situate a display on two legs extending from a wheeled base unit. The BeamPro, for example, sports a 17-inch LCD with two wide-angle cameras, a six-microphone array with echo and background noise cancellation, and integrated speaker. Sutable Technologies also uses proprietary software and algorithms and TLS/SSL, AES-256, and HMAC-SHA1 security, meaning all communication passing through the system is encrypted.

The Kubi also moves but doesn't include wheels. Instead, the system essentially lets a remote user tilt, pan, twist, raise, and lower a tablet mounted to a base unit, all of which aims to give the user a more dynamic presence in videoconferences, view more of the environment, and make more direct face-to-face contact with other participants. Rosenthal says some customers use Kubis nearly all day, every day.

Karen Tingey, a remote worker for Intuit, says the Kubi is the best telecommuting experience she's had. "The consistent feedback from my team is that they often forget I'm not there in person," she says, to the point "it really doesn't

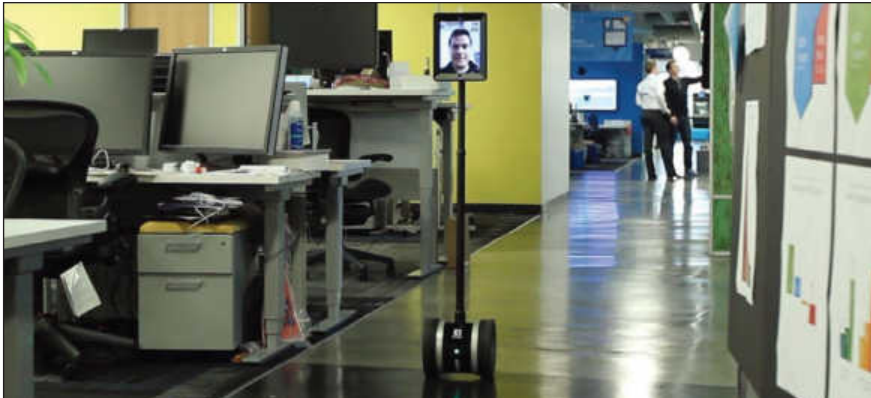
A Report From The Trenches

When Justworks (www.justworks.com), a startup that helps companies cover their benefits, payments, and HR needs, was seeking ways to make a key team member who was working remotely feel "really integrated" with day-to-day office happenings, it turned to the Sutable Technologies BeamPro tele-robot after seeing one in action.

"I'll admit, I was skeptical at first—it looks like an iPad on a stick—but it has been great," says Will Young, Justworks director of micro-acquisition. "It really feels like our teammate is more present than he was before we got him the robot." Before adding the BeamPro, Young says it was easy for a remote worker to feel marginalized when participating in videoconference meetings. "Somebody has to remember to dial you in every time. It's harder for you to get a word into the conversation. Nobody is making eye contact with you. In general, the remote person just feels more 'absent' than 'present,'" he says.

Conversely, using a tele-robot gives a remote worker a physical manifestation that's easier to include in conversations, Young says. "You can interact with the person more naturally. You walk with the person to and from meetings. It changes how you feel about the person and how much you engage with them in subtle ways," he says. Recently, Young says a co-worker was excited enough about the tele-robot to give it a hug as it pattered around the office. "It's a small thing, but it's impossible to replicate that kind of connection with just a videoconference," he says.

Young notes that getting the tele-robot to/from meetings can take some awkward maneuvering. Battery life can also pose problems in long meetings. Further, multitasking on a computer (doing screen-shares, for example) can cause lag for the remote worker. There's also a matter of expense. As Young notes, "these things aren't cheap." That said, Young says adapting to a tele-robot has been easy, and his initial perspective on tele-robots has changed. "I can easily see how these things will become an integral part of the Justworks office in the future," he says.



Tele-robots like those from Double Robotics give remote workers the mobility and freedom to move around an office complete with real-time video and audio streaming abilities.



Both Suitable Technologies and Double Robotics offer charging docks for their various tele-robot units that remote users can navigate the robots to when needed.



Suitable Technologies offers Beam+ and Beam Pro tele-robot models respectively aimed at consumers and enterprises.

matter that I'm remote." Lou Gallo, an employee and remote worker at Onshape, has used Kubi for about 20 months to help create a presence in the company's Boston office from his home in Phoenix. Gallo has access to numerous communication/collaboration tools but says the Kubi is his go-to. "I log eight-plus hours a day on it," he says. "I'm part of our culture in Boston, even though I sit at my home in Arizona."

Lisette Sutherland, director at Collaboration Superpowers, which helps teams work together from anywhere, also uses tele-robots, which she considers a couple steps up from videoconferencing due to the mobility and "sensation of 3D sound" they provide. "The ability to move oneself as a remote participant is more powerful than people expect," she says. "As the person beaming in, telepresence gives you the ability to move and keep track of who is in the room. For those who are in the flesh, telepresence gives actual presence to the remote person."

Beyond using tele-robots to attend conferences and panel discussions "on the other side of the world," Sutherland has led workshops in Lebanon while in Barcelona and in Palo Alto while in the Netherlands. "I'm not saying we should all stay home and just beam around the world. But when we can't physically be somewhere, or if our companies have a need to enhance the virtual team experience, we certainly have some great options to explore," she says.

An Iffy Future?

Despite the undeniable potential of tele-robots, there's a sentiment among skeptics that while tele-robots are handy, they aren't exactly mandatory. Kraus, for example, sees marginal, if any, value in tele-robots for typical videoconferences. The more compelling value with tele-robots is their mobility, especially in dynamic environments, she says. "The ability to move around and see things in real-time is the benefit that has the potential to drive adoption," she says.

Dan Kara, ABI Research practice director for robotics, says the marketplace for tele-robots, which ABI quantified as recently as March 2015, is still fairly small

DORA, Your Personal Avatar

Meet DORA (Dexterous Observational Roving Automaton), a robotic platform created by a team of University of Pennsylvania mechanical engineering students. In short, DORA is an immersive tele-operated platform designed for navigating and exploring remote locations. It's been described as "your personal avatar" and even as a form of early teleportation in the sense it makes someone located remotely feel like she's in the same room as DORA.

Theoretically, anyone located anywhere could log in to, drive, and manipulate DORA. The system incorporates patent-pending technology to track the driver's head movements in six degrees of freedom and simultaneously provides real-time visual and audio feedback via an Oculus Rift VR headset. Christopher Mims, writer for *The Wall Street Journal*, describes the DORA experience as "a robot that exactly copies every movement of your head" while you simultaneously see what DORA sees. He writes DORA is a natural evolution of the "Skype robot with wheels" experience that consumer tele-robots provide. "As I use DORA," Mims describes, "I find myself thinking I'm inhabiting the robot's body. As I turn around to look at my actual body, sitting at a desk and wearing a VR headset, I think, 'Who is that guy?'"

DORA's team hails the use of virtual reality and tele-operated robotics as establishing a groundbreaking PVI, or physical-virtual interface. However the team describes DORA, the system's potential seems almost unfathomable in scope.



A group of University of Pennsylvania students has created a robotic platform called DORA that it describes as "your personal avatar."

and hasn't lived up to early expectations. Companies finding success using them are mostly smaller firms in the Bay area on the leading edge in terms of adopting technologies, he says. "Once you get past that, it really drops off," Kara adds. "The robotics industry has a lot of really good things going for it, but it has a lot of bad things going for it in terms of what users' expectations are."

Kara acknowledges there's an often-repeated notion that there's a huge social or moral imperative for using tele-robots—think of the elderly in-home example or that tele-robots and remote working will keep more cars off the road and enhance workers' home lives. "Well,

who is going to argue with that?," Kara says. "The problem is that's just not enough to make a viable marketplace or a viable business model."

Other challenges concerning tele-robots include wireless coverage/connection dropouts and difficulties in navigating around obstacles. Kara notes manufacturers are making improvements concerning wireless support, but "there's a reason why when you see commercials for remote telepresence systems or robotic vacuum cleaners they don't look like they're in any house I've ever lived in," meaning tele-robots are typically shown moving on hardwood floors in areas with little clutter and few rugs. "These systems

have a hard time when getting into places that are lived in," he says.

Another issue simply concerns the risk that colleagues initially will find tele-robots distracting and annoying. Bamforth says though workers may be more comfortable sharing time and information with remote colleagues now, they might view "remote eyes" as a covert encroachment on their personal space. Plus, some employees still don't like even using videoconferencing because they don't like being on camera, he says.

Kara says while some tele-robots have gone away, others are entering the marketplace. To stick, Kara says companies need to find areas where the employees require a social presence, embodied presence, and mobility traits. Such companies must be willing to spend on novel technologies that can gain them incremental savings, boosts in productivity, or additional capabilities they can tie to revenue. "So far, the marketplace hasn't found that yet," he says.

Chun agrees acceptance has been a bit slow and gradual, but he believes as the technology proves itself and demonstrates its economic worth, greater acceptance and adoption will result. "In the same way teleconferencing software has matured, such as with Skype, the computer with a mobility base will be universally adopted by businesses," he says.

Finding Value

As Kraus notes, tele-robots are still very much in the early adopter stage. She expects it will be five to 10 years before any type of meaningful adoption occurs, "assuming that the robots provide a meaningful value proposition at an affordable cost. Remote participation and travel cost-savings apply to any videoconferencing system. Robots need to offer unique benefits and functionality to succeed." For now, Sutherland says based on her experience, reality concerning tele-robots has exceeded her expectations. "And what I find most exciting is that we're still in the beginning phases. The technology will only get better," she says. ■

CPU IS MOD CENTRAL

If you love great mods, *CPU* is the place for even more coverage of the latest mods, the greatest modders, and mod contest winners from all over. In these pages, you'll find modified stock cases, custom builds, and everything in between.



And if you have a mod you want to share with the world, drop us a line and let us know at madreadermod@cpumag.com.

Each month, one modder's work will show up on the cover and in the monthly "Mad Reader Mod" feature. If it's yours, you will win a cool \$1,500—and massive bragging rights.

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Game Of The Month

Yeah, we know you have blogs to post, video to encode, reports to write, and code to compile. We do, too, but you have to take a break once in a while (and maybe blow some stuff up). That's why each month we give you the lowdown on what to expect from the latest interesting games.



There was a moment in *The Witness* where I felt trapped. I solved a few puzzle panels in a row and then the walkway beneath me moved, separated from the main island, and connected to a new area with winding metal paths and stairs. I looked around and realized there was no way out except to solve two puzzles to open a door or to solve a series of panels to keep moving forward. I felt like I was out of my depth with some of the other panels, so I opted for the door. I solved the first puzzle easy enough, but then I spent 20 or more minutes trying to solve the second one. Yep, I was trapped, and it was time to quit playing for the day.

I left, but I couldn't stop thinking about the puzzle. Luckily, I had taken a picture of it with my phone. I sent it to myself in an email and uploaded it into MS Paint (I know, I know). I started tracing it again and again. Nothing seemed to work. Then, something clicked. I realized I had to invert the way I was looking at the puzzle. I had to actually change the way I was thinking, and once I was able to solve the puzzle of my own misguided thought process, I finally came around to the solution for the real puzzle. That feeling of relief, and the feeling of accomplishment once I was able to leave that area, is something not many games, if any, can achieve.

The Witness seems simple on the surface. You walk around a beautiful and colorful island full of unique locations and solve a series of maze-like line puzzles. But as you move deeper into the world, you'll find yourself surrounded by different puzzle mechanics that will take you out of your comfort zone and make you think outside the box (sometimes literally). While the world beckons you to explore and the puzzles start off simple enough, things can quickly become complicated as you try to progress.

Searching For Meaning In A Maze

BY JOSH COMPTON

\$39.99 (PC, PS4) • ESRB: (E)veryone
Thekla • www.the-witness.net

If you don't enjoy the challenge of not only solving a puzzle but understanding how it works and why you were able to solve it, you're probably not going to like *The Witness*. To fully enjoy the game, you need to be willing to tackle that challenge head-on and let the world around speak to you.

Even when I thought I was stuck, the game didn't make me feel stupid for not quite "getting it." I had to realize, in my own time, that the game was slowly feeding me information and telling me, without any text or dialog, how to solve the different types of puzzles in the game. It felt like *The Witness* was communicating with me, trying to tell me that I needed to explore a bit more and then come back later.

The Witness, with all its secrets, gives you just enough information and holds onto its mystery just enough to keep pulling you through the island. Each time you solve a given type of puzzle, it gives you a little more insight into the rules of the island. As an example, with the knowledge I gained from later puzzles and from moving on to a different area for a while, I was able to go back to the game's start and open a vault that at first seemed impenetrable.

Some puzzles reward you with more puzzles, but others open up an entire new area to learn and explore. But in the end, the real reward for me was getting to play a game as masterful as *The Witness*. It took nearly eight years for Jonathan Blow and his team to finish the game, but it was well worth the wait. If you're not afraid of solving puzzles and can work through the confusion and frustration that sometimes comes along with it, you owe it to yourself to experience *The Witness*. I've never played anything quite like it, and I don't think that experience will be replicated anytime soon. ■





A year after the events of *Tomb Raider* (2013), Lara Croft has been discredited in the ensuing cover up. So she goes home and buries herself in the research of her late father, a man who was also shunned by his peers for obsessively pursuing an immortality-granting artifact called The Divine Source. His shame and disillusionment ultimately took its toll on him, but Lara's trip through a tomb in Syria suggests that maybe he was onto something.

The game starts with Lara and her cohort Jonah scaling a snowy mountain peak in Siberia in search of the mythical lost city of Kitezh. As Lara leaps, shimmies, grapples, zip lines, and rope swings her way through the wilderness dotted with tombs (seriously, Siberia is teeming with tombs), a mysterious organization called Trinity keeps popping up to thwart her expedition.

Like the previous game, Lara has a deep skill tree to help make her a more efficient killer, hunter, and survivalist. You earn points for nearly everything you do, but performing headshots and stealth kills, chaining your attacks, and using finishing moves grant you even more. Lara has a host of firearms, bows, and other gear that she can wield, and each item can be upgraded to deal even more damage. Wild animals such as bears, wolves, and lynxes roam the forests and valleys, and although they're challenging prey, their pelts are necessary for crafting Lara's upgraded gear.

As you explore, you'll discover caches of Byzantine coins that you can exchange in-game for weapon upgrades. Toward the end of the 30-hour campaign (it took us 34 hours) you'll have loads of the things, so don't hesitate to spend them.



That Belongs In A Museum

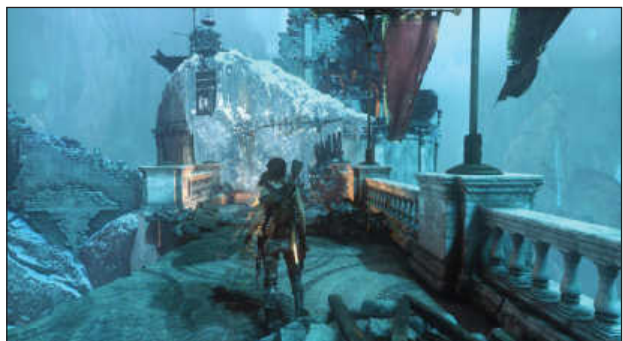
BY ANDREW LEIBMAN

\$59.99 (PC, Xbox One) • ESRB: (M)ature
Crystal Dynamics • www.tombraider.com

The game also doles out credits for performing various feats. From the Marketplace menu, you can spend these on Expedition Cards, which modify gameplay in a variety of ways. There are cards that make the enemies stronger, give Lara even more of an unfair advantage, and just make things more interesting. Exploding chickens, big head mode, automatic reloading weapons, and time-slowing enhanced reflexes are just a few of the effects you can enjoy in the alternate gameplay modes. Score Attack changes the game objectives and gives you a time limit, Remnant Resistance lets you configure your own objectives and battle the enemies you choose, and Chapter Replay lets you dive back into completed portions of the game with all the skills and upgraded weapons you've managed to earn during your playthrough. Four difficulty levels add to the replay value and ensure that the game is as easy or difficult as you want it to be.

The PC version of *Rise Of The Tomb Raider* looks fantastic, and as such, the developers recommend a GeForce GTX 970 for running the game at 1080p with high settings. Even more impressive than the visuals is the story, which has just the right amount of plot twists, solid voice acting, and hours of spoken dialog that really give you a sense of the numerous characters and their varied motivations. But how good is Lara, the heart and soul of the game? Fear not TR fans, Lara's arc is believable and interesting, her movements are lifelike, and the voice work is better than ever.

Rumors suggest that Crystal Dynamics is working on another TR game, but after watching Lara tear through mercenaries, wildlife, and supernaturally-powerful guardians like a hot machete through a snow drift, we're surprised there's anyone dumb enough left to oppose her. ■



LAYERS OF FEAR

What frightens you? Is it the well-timed, unexpected jump scare? Perhaps it's the disfigured monster (or horde of disfigured monsters) that pursues you relentlessly, hungry for a snack? Maybe the atmosphere and story combine to create a crescendo of dread, letting your own thoughts become the monster. *Layers of Fear*, the latest from Polish developer Bloober Team, uses damn near everything in the horror toolbox, to varying degrees of success.

The game puts you in the shoes of an unnamed painter (I never discovered his name, at least) who's clearly fallen on hard times. As fame, fortune, and sanity have slipped away, you're left with a single, overriding compulsion: finish the masterpiece you were born to create. The journey sends you through your Victorian mansion, which quickly turns into a labyrinthine nightmare that reveals the depths of your psychosis.

Crazed artist sound a little tropey to you? Well, it is, but this is the first time we've seen a horror game use painting as its focus, so we'll cut LoF some slack. We're less charitable with the scare tactics the game tends to rely on, though. The first half of the game seems positively giddy at throwing jump scare after jump scare at you, to the point you know exactly where they're lurking. Nothing makes fear wilt quite like predictability.

For a game that puts painting front and center, perhaps it's no surprise that LoF's writing tends to be pretty clichéd. Granted, great horror writing isn't easy to pull off, but like its jump scares, LoF takes every opportunity to remind you, "HEY, THIS ARTIST IS CRAY-ZAY!" When your game is



The Tell-Tale Canvas

BY VINCE COGLEY

\$19.99 (PC, XOne, PS4) • ESRB: (M)ature
Aspyr Media • layersoffear.com

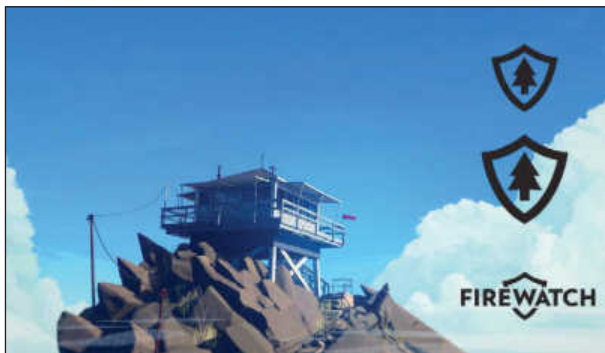


essentially a guided tour through a haunted house, a little more subtlety here and there would've made for a much more chilling experience.

The real star of LoF is the haunted house. As you explore, the mansion twists, turns, and folds back on itself. Rooms reconfigure and disfigure themselves as you look around, and the effect is marvelously seamless. Built on the Unity engine, LoF's graphics are better than mind-blowing—they reveal the painter's madness so perfectly that it very nearly redeems the game's heavy-handed writing. Add music that's pitch-perfect, and I was left wondering whether LoF would've been a stronger game without speaking a single word.

Although LoF lurches and flails through its first half (not unlike the ghoul that torments you at various points throughout the mansion), it really finds its footing at the midway point and wraps up with a satisfying denouement. In fact, LoF has three endings based on a few minor choices you can make, and each one (h/t to YouTube for "unlocking" them for me) is profound in its own way. It's hard enough to have one good ending; having three sensational conclusions is LoF's true *magnum opus*. What started as crayon scribbles became a real work of art.

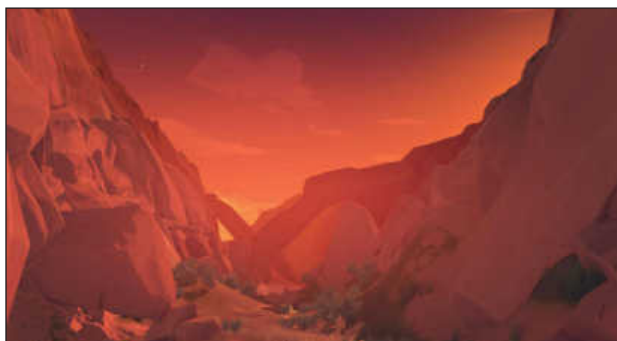
So in a way, *Layers of Fear* succeeds in spite of itself. Collectors and treasure hunters will also enjoy that the game rewards you for opening every drawer and inspecting every nook and cranny (including the ceiling). Depicting psychosis is a difficult and delicate task, and there are definitely moments when the game fails. But when it succeeds, it creates a waking nightmare that's tough to shake. If that frightens you like it frightens me, let *Layers of Fear* paint you something scary. ■



Firewatch is all about the story, and your experience with the game will almost solely depend on whether you connect with the two main characters, Henry and Delilah. What I will say is that the game starts off with a Pixar-like punch that will at least make you feel somewhat sorry for Henry as he embarks on his summer as a fire lookout in Wyoming. His only touchpoint in this lonely scenario is Delilah, who also happens to be Henry's boss and a fire lookout in her own right. You communicate with her via handheld radio as she gives you orders, but your relationship soon evolves, depending on which dialog options you choose.

In my playthrough, I found the conversations between Henry and Delilah to be touching in certain situations and outright hilarious in others, but what impressed me most was how real they felt. I don't think I've ever played a game where I got so lost in the world and found myself thinking about what Henry would do in a given situation and what choice he would make rather than what I thought was the right decision. I almost felt like I was in on the writing process and helping craft the story along the way. And every time the story twisted and turned, I was right there with Henry and Delilah trying to figure out what was going on as the mysteries began piling on top of one another.

Your interaction with the world typically involves Delilah telling you about an event, such as fireworks in the sky or a pillar of smoke rising in the distance, and then telling you to take care of it. You have a map, compass, and backpack at your disposal at first, but you gradually pick up tools along the way that give you access to new areas or new ways to interact with areas you're already familiar with. If you're like me, you'll probably get turned around a few times, so it's important to check the map every so



Fire In The Sky

BY JOSH COMPTON

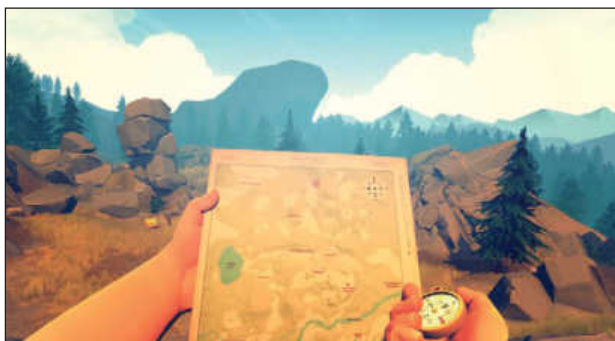
\$19.99 (PC, PS4) • ESRB: (M)ature
Panic • www.firewatchgame.com

often, but getting lost can actually benefit you in certain situations as new conversations unlock and you get to know the characters better.

The other star of Firewatch, besides the two interesting and relatable characters, is the art design. Much has been made of Olly Moss's involvement (look up his poster designs when you get a chance), and it shines through every step of the way. From the rock formations, trees, and rivers to the posters, book covers, and every item you interact with, the game is brimming with style. I'll admit I fell in love with the art style when I first saw the trailer and screenshots, but exploring the world of Firewatch and interacting with it is like stepping into a painting.

You can't talk about Firewatch's visuals without mentioning the lighting. As you pass through each day in the game, you get a real sense of time, whether it's early in the morning, deep into the heat of the afternoon, or at sunset. The way the light shines through the trees and outlines the silhouettes of faraway cliffs and outcroppings is—there's no other word for it—beautiful. There were times when I could've moved the story forward by performing a certain action, but I instead decided to sit there and take it all in.

Firewatch was a special experience for me. I could honestly see myself playing it once or twice a year just to spend some time with Henry and Delilah again, and of course to wander through the beautifully realized world. In a medium where narratives tend to rely on fantasy, science fiction, or other otherworldly themes, it was refreshing to play a game that was so grounded and human. This is the first release from Campo Santo, which includes developers that worked on Telltale's *The Walking Dead* and the *BioShock* series, but with this game, the studio has created something wholly unique. Firewatch is an instant classic in my eyes, and it's clear that Campo Santo has a bright future. ■





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Arrows & FRAPS

Benchmarking With Rise Of The Tomb Raider

If you've read our review of Rise Of The Tomb Raider, then you know we're fans of how great the game looks. To get the most out of Lara's latest adventure, however, the developer suggests using a powerful graphics card. In this article, we're passing along some instructions for benchmarking with ROTTR. Use this benchmark to tweak your settings to the point that you're happy with the game's performance, or maybe it'll convince you that it's time for an upgrade. Whatever the case may be, this game is worth it.

Before You Get Started

In order to run the benchmark, you'll need to download and install the frame-counting utility FRAPS (www.fraps.com).

Once it's installed and running, go to the FPS tab, put checks in the FPS and MinMaxAvg boxes. The utility stores a log file in the C:\FRAPS\Benchmarks directory. But before we can begin, you need to progress far enough in ROTTR's campaign to unlock The Acropolis level. Once there, manually save the game and quit.

The Run

Start by launching and running FRAPS, then launch ROTTR. From the main menu, click the Expeditions menu, then choose Score Attack and The Acropolis for the Mode and Level, respectively. Click Continue, click Continue again on the Choose Challenges screen, and then click Start Game on the Choose Cards screen and press the FRAPS Benchmarking hotkey (F11 by default) once the countdown begins.



You can pop these three with a single poison gas arrow.

From here, press and hold the SHIFT key to run down the mountain path, collecting the blue wisps to keep you moving in the right direction. There will be a cutscene when you approach a stone archway, but these are rendered in real-time and shouldn't adversely affect your framerates, so you won't need to skip them.

When the cutscene ends, immediately use your bow to take out the three men, starting from the right and moving to your left. Next, grab a couple more wisps, but then target the middle of three men in the far-right corner of the marketplace, shooting him with a poison gas arrow (using the middle mouse button). This should take out all three and maintain your stealth. Pick up the remaining wisps, and head down the narrow path and into the underground area, taking out the two men you'll find there, one at a time, using your bow. Next, press F to perform a stealth attack,

and then use another poison arrow to nail the guy in the middle of the room, mopping up anyone left standing with the bow.

Move ahead until you fall through the floor, then silently take out the two guys here. There are enough mushrooms in this area to craft more poison arrows, so grab them to make the final room a breeze. Climb through the high gap in the bricks, head left, and then hit the middle guy with a poison arrow. Step forward, and when the next cutscene begins, hit the FRAPS shortcut again to stop counting frames.

Our Scores

This benchmark offers a little bit of everything in a span of about four minutes. With the graphics set to High, we were able to score between 70 and 74 frames per second on average. Check out the video at bit.ly/1Ldd1B2 to see how we did it. ■

Test System Specs: Processor: Intel Core i7-5960X; Motherboard: GIGABYTE GA-X99-Gaming G1; GPU: GIGABYTE GeForce GTX 970 XTREME GAMING; Memory: 16GB Crucial Ballistix Elite DDR4-2400; Storage: 240GB OCZ Vertex 3 MAX IOPS SSD; OS: Windows 10 Enterprise (64-bit)

Q&A With Frank Azor

Alienware Leader Talks 20 Years Of Serving PC Gamers

On Oct. 15, Alienware will turn 20 years old. That's 20 years of innovating, developing, and building top-level desktops, notebooks, PC consoles, and other PC gaming gear with PC gamers specifically in mind. To learn about Alienware's origins and how it grew, evolved, innovated, and prospered over that stretch, there's no better source than Frank Azor. As Alienware's fourth employee ever, Azor hasn't just been around the block, he helped cut and pave the stones that Alienware used to build a global, critically-acclaimed presence.

Hired in 1998, Azor is now general manager of Alienware- and XPS-branded products at Dell, which acquired Alienware in 2006. Along the way, he left college early to focus completely on Alienware; acquired multiple patents as an engineer; helped bring about numerous company and industry firsts (including the first high-performance gaming notebook with the Area-51m); and helped Alienware successfully transition from a small, private custom PC gaming system builder to an integral part of Dell's business. All this and he's still just 34. In association with a host of "20 years of Gaming Excellence" events scheduled this year to mark Alienware's 20th anniversary, we spoke with Azor about Alienware's past, present, and future. (Read our entire conversation at www.computerpoweruser.com/20191)

Q: It's safe to say some users have never owned anything but an Alienware-made system. What does that loyalty say both about Alienware and its customers?

FA: Thanks for the question, actually. We've been doing this a long time. Almost 20 years, as we'll celebrate this year. We know the thing that truly kept us successful over this time frame has been our emphasis on our customer base, and also the leadership in charge of Alienware. We are our own customers. It helps a lot in ensuring that we preserve our integrity and preserve our tenants as a brand and as a company to our own customers because when we don't, if we don't, we're violating that trust and loyalty that we have ourselves in our products.

We started by focusing on a very specific profile or user, that being the PC gamer. I think by doing that—and over the years we deviated in some points in our history where we experimented a little bit with workstation customers and digital home stuff, but we always came back to the PC gamer, and that's always been our primary focus—it's allowed us to prioritize all of our thinking, all



of our resources, all of our innovation. Everything we do is centered around this thing we love to do ourselves, which is play videogames, and for us specifically, primarily on our PCs. So that's been the secret sauce, if you will. Even when Dell acquired us almost 10 years ago now, it did an excellent job of listening to us and preserving everything that made Alienware unique and special. It only

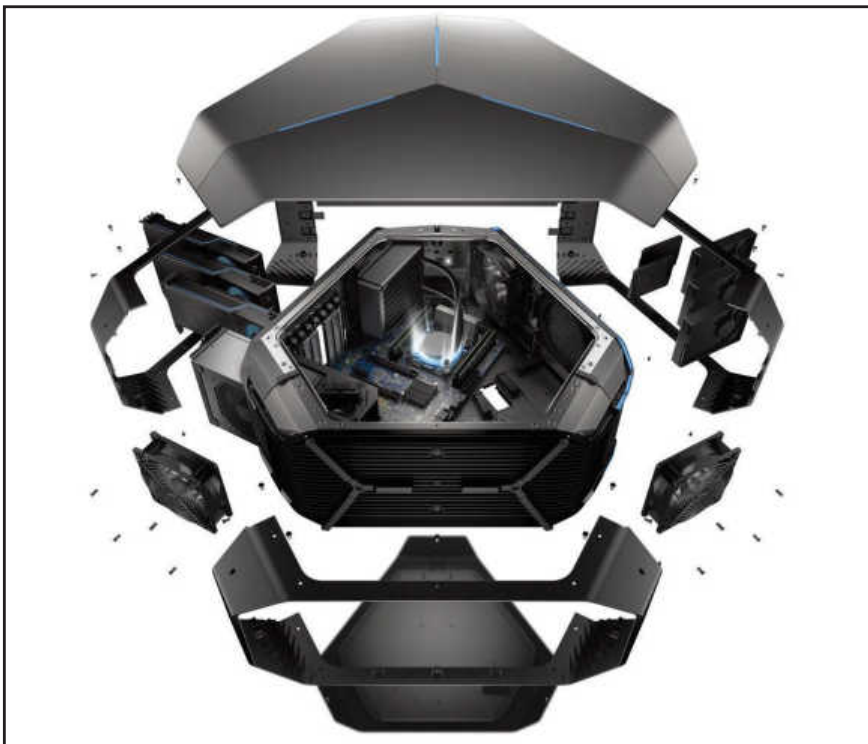
serves to help amplify everything we wanted to do and help our vision come true across all these different innovations and categories and countries that we've expanded to since the acquisition. As our customers have seen our progression over the years, they've seen us keep them at the forefront of everything we do. They've seen our quality only improve over time. They've seen our commitment to them improve over time. I think that's what keeps folks on Alienware and trusting us over such a long period of time.

Q: You made an interesting comment elsewhere about Alienware serving the person who can build a great gaming system himself but who no longer has the time or even energy to do so. That's where a high-performance turnkey gaming solution is of great value. Can you comment on that?

FA: A lot of us who work here, and even the founders of the company, were DIY guys. We built it ourselves. And for a long time even after we started Alienware, we just still tinkered and built our own rigs. The truth is you're always going to build your



Alienware invested millions of dollars and three years of design, innovation, development, and production work into the Area-51 Triad chassis before its launch in 2014.



The Alienware Area-51 Triad chassis blown apart to reveal all its internal design and innovation glory.

own rig better than anyone else is going to build it for you. You'll always find a way to build it cheaper. You'll always find a way to customize it just the way you want it. There's no way we'll ever be able to compete with that and that's nowhere in our strategy. We're trying to let people know, "Guys, that's not what we're trying to do. We're not trying to say we build it better than you by any means." But there comes a point in most people's lives, not everybody, but most people, where we still love PC gaming, but we have a little less time for it. When that occurs in your life, that's where Alienware makes the most sense.

If you don't want to have to learn all the technical know-how of building your own system or you've run out of time to be able to do so and just want to really focus on playing the games, we give you a turnkey system that's not only going to be pretty damn good as compared to what you'll build yourself—it would probably get you 90% of the way there—but when something goes wrong, it's our problem, not your problem. You call us, we'll get it up and running for you. We'll even dispatch an engineer or a technician to your house to swap out the parts for you and get things running for you so you basically have as little downtime as possible, if not any downtime. Then we have some retail partners even where you can bring the system in and they'll fix it for you onsite.

Q : Alienware has already announced several events and new releases for 2016 to correspond with its 20th anniversary, including an Area-51 Case Mod-Off Challenge that CPU is participating in. What other events and releases do you want customers and others to know about, and what does Alienware have planned for the near future?

FA : There are a lot. We have several new things going on around our community. Our Twitch page. Our Alienware Arena. Our YouTube channel. We're going to be doing a lot of cool things around there to inform folks about our history, to have them participate and join us in celebrating the 20th anniversary.

The Alienware Story, 20 Years In The Making

Alienware is the rare company that's earned and deserves every bit of the "pioneer" and "trailblazer" accolades customers, critics, and industry vets have tagged it with over the years. When Alienware turns 20 years old in October, it will also be the rare company that's never altered from its original mission: building, innovating, and supporting extremely high-performance PC gaming systems specifically for PC gamers.

It's not exaggerating to say Alienware's 20-year ride has been a wild one. Beyond scads of industry firsts, there was the acquisition by Dell in 2006 and, of course, a steady stream of now iconic, industry-defining gaming products. In 1997, Alienware was the first to release a custom-built gaming PC. The next year, it released the legendary Area-51 desktop. In 1999, it was the first to offer custom-painted desktops and first to offer both 16- and 32-bit graphics and sounds cards so gamers could play DOS and Windows games on the same rig. In

2002, Alienware forever redefined where PC gaming could occur with the Area-51m, the first high-performance gaming notebook. Launching the first liquid-cooled gaming desktop and first customizable chassis lighting, and being the first PC gaming system maker to offer user-upgradeable graphics cards and break the 4GHz barrier via an overclocked Area-51 ALX are just a few in a long, long line of other accomplishments.

Fitting of a technology startup, Alienware's wild 20-year ride started in a garage (in the Miami area) with just \$13,000 in financial backing. What the fledgling company did have was an abundant supply of conviction,

passion, and work ethic supplied by its like-minded founders Nelson Gonzalez and Alex Aguila who believed that rather than having to mass-produce systems at a commodity as other manufacturers were doing, they could cater to an audience of hard-core gamers just like themselves who craved custom-built, high-octane systems that let them game the way they yearned to. Moreover, Alienware was determined from the

outset to hang its hat on providing personalized 24/7 customer support that made any problems with systems their own and not their customer's. More than 200 editor choice awards and millions in sales later, Alienware's success and dedication to its customer base continue to speak volumes.

Alienware has planned numerous "20 Years of Gaming Excellence" events to celebrate its 20th anniversary, including an Alienware Case Mod-Off Contest where *CPU* will help pick a winner from three teams of pro modders. Other events, including some surprises, are set for PAX East, E3, and other

events. In no way, though, is Alienware heading into its next 20 years with a sense of fulfillment. Appropriate for a company whose own name and that of its products (Area-51, Hangar 18, Aurora, and so on) stem from its founders' love of space exploration, aliens, and science fiction, Alienware is committed as always to keep exploring new gaming frontiers. Already this year, Alienware has previewed its upcoming Alienware 13 R2 gaming notebook with its remarkable 13-inch OLED display. Plus, Alienware is heading into the world of virtual reality with guns blazing via a bundle that combines an Alienware X51 desktop and Oculus Rift at a reduced price for customers.



I don't want to ruin all the surprises, though. We're going to be showing some cool stuff at E3 that's going to be in this vein. We look at 2016 as kind of the year of VR. This is like the first year of what we expect it is going to be in terms of being a really successful platform and medium for consuming and interacting with content and being relevant to our lives for a pretty decent amount of time, probably as relevant as the PC has been for the past 30 years. So a lot of the stuff we're doing around 20 years is to look at the past and the amazing accomplishment we've had, but we also want to look at the future and what the next 20 years are going to bring for us and what technologies and products and experiences are going to be relevant for everyone, the entire industry,

developers, customers, us, and our kin for the next 20 years.

We want to have interesting dialogue like that. So there will be a dialogue at PAX East around that where I'll be participating in. We're doing an event here in Miami on March 31 with a panel to talk about VR and its future, and the 20th anniversary ties into that very well. The way we look at VR to us is a lot like "Back To The Future" because VR is not the easiest thing to set up. You have specific hardware requirements that are pretty burdensome. The software has to be optimized. The entire platform has to be optimized, which is why Oculus has been really sensitive to this Oculus-certified PC program. There's a fair amount of technical work that needs to go into getting an Oculus-certified system, and

HTC for that matter, to work smoothly, like a turnkey experience. What does that sound like? That sounds like Alienware in 1996 and 1998. Not too different of an environment, right? Games were tough to get to work, required a lot of hardware, and you had to be technically savvy to get this stuff to work. Well, we've been there.

Q: It often gets noted you're Alienware's fourth employee ever, with the implication being that you've seen it all. On a personal level, though, how has being a part of Alienware and this industry so long enriched you? What has it taught you that you apply every day?

FA: Wow. To be clear, I've been here since 1998, right after we renamed

the company to Alienware. I don't like to say the original name because I like to use it as a trivia question. But it was actually a different name before that. Really, the angle of creating Alienware occurred in 1998 when I joined.

Wow, that's a deep question. Alienware has been more in my life than it hasn't been. I've been a part of Alienware longer than I wasn't a part of Alienware. I've been here about 17 or 18 years now, and I'm

over 100,000 employees that does business in pretty much every country around the world. I had to learn what it was like to integrate into a company like that. That was a lot to learn.

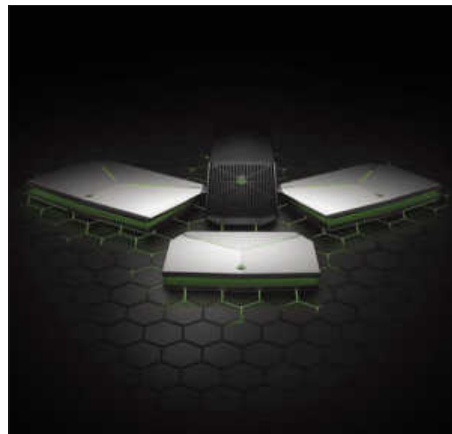
Q : A lot has been written and still is about Dell's acquisition of Alienware in 2006 and how it would taint what was special about Alienware. You've stated many times, though, that

the list below the line started shrinking considerably and the list above the line starting growing considerably.

We had always wanted to build an ultra-portable notebook, but it's so expensive to build a notebook product. The engineering that's involved. The tooling that's involved. It's a lot of the reason why when you look at a lot of our smaller competitors, they often pick up someone else's notebook and rebrand it because it's literally millions of dollars to go make your own notebook. It's tough to do that, to go and experiment in a notebook category like the M11X that you're not sure. There's no market there, and you don't know if there's going to be a market around it. And that moved from below the line to above the line. That's when we were like, "Wow, this is really going to change things." And then we took external graphics, and that moved from below the line to above the line. "Let's go put a patent around it. Let's go put a whole team around it. Let's go make it a reality." We were like, "Wait a minute. This is getting really interesting."

Q : Alienware has long had a global presence, yet it has stayed true to its Miami-area roots throughout its 20 years. What is Alienware's ongoing relationship with the Miami community, and why is it important?

FA : We're in the same building today that we were in over 10 years ago when Dell acquired us. How's that for symbolism for how true to our roots we actually are? Miami is where I was born and raised. Most of the team that still works out of Miami was born and raised in Miami or moved here. We have teams all over the world. You can't run a global organization like ours out of one city. So we have teams in Austin, California, Seattle, Taiwan, Europe, China, and Australia. We have teams everywhere. But Miami has kind of remained that central hub where everyone reports to, where we come together at least once a year because this is where it all started. This is where the roots are. ■



The Alienware Graphics Amplifier, an external box that brings full desktop system-level graphics performance to notebooks, is a perfect example of how a company full of PC gamers at heart sees a need and fills it so other gamers can also benefit.

only 34 years old, so about half of my life has been Alienware. I met my wife at Alienware. I had my kids when I was at Alienware. At one point, my picture was on the manual that we used to ship out to customers wearing some glasses and a mask like a secret agent, which was pretty funny.

It's not everything I know in my professional life. I was given a phenomenal foundation by my parents and my siblings, but when it came to professional experience, up until 2006, all I knew was Alienware. I knew Alienware as a small startup. I knew Alienware as a mid-sized company. And then when we got acquired by Dell, I had to learn a lot of new things. I had to learn how to operate in a large multinational enterprise company with

Dell has actually enabled Alienware in numerous ways. Bottom line, what is Alienware doing now that it couldn't or wouldn't be doing without its connection to Dell?

FA : We always have this funnel of ideas of things we want to go do. And when we were a small, private company, we called it "the line," things above the line and things below the line. The list of things below the line that we couldn't do or afford to do or have the resources to do was huge. After we got acquired and started working on the strategy with Dell as to what our long-term strategy was going to be, the simplest example that I can give you is

Look For *CPU* At These LAN Parties

03.04-06.16

FITES LAN
Mechanicsburg, PA
www.fites.net

03.04-06.16

GNWLAN15
Hillsboro, OR
www.gnwlan.com

03.12-13.16

Gamers for Giving 2016
Ann Arbor, MI
www.gamersoutreach.org

03.12-13.16

LANTasy 2016
Victoria, BC
www.lantasy.com

03.17-19.16

South By Southwest
Gaming Expo
Austin, TX
www.sxsw.com/exhibitions/gaming-expo

03.18-20.16

LANified 25: Colossal
Calgary, AB
www.lanified.com/events/details/22

03.18-20.16

MidWestLAN16
Milwaukee, WI
www.midwestlan.com

03.19-20.16

LanOC V18
Van Wert, OH
www.lanoc.org

03.19.16

Oklahoma Gamers Group
Oklahoma City, OK
www.okgg.org

03.19.16

Willamette Valley
Gamers LAN
Eugene, OR
www.wvgamers.com

03.25-27.16

Easter LAN
Menomonie, WI
pong.uwstout.edu

03.25-27.16

Wardogz LAN Group
Orange Park, FL
www.wardogz.org

04.08-10.16

ATR Gamers
Troy, NY
www.atrlan.net

04.09-10.16

LAN WAR XXX
Bloomington, IN
www.indiana.edu/~gaming/lanwar.html

cpu

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04.09-10.16

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Miamisburg, OH
www.nexuslan.org

04.09.16

SWVA Gaming X
Abingdon, VA
www.swvagaming.com

04.15-17.16

LAN ETS
Montreal, QC
www.lanets.ca

04.15-17.16

Maryland
LAN Gamers
Greenbelt, MD
www.marylandlangamers.net

04.15-17.16

VectorLAN 7
Portland, OR
pdxlan.net

04.16.16

Oklahoma Gamers Group
Oklahoma City, OK
www.okgg.org

04.16.16

Willamette Valley Gamers LAN
Eugene, OR
www.wvgamers.com

04.22-24.16

PAX East*
Boston, MA
www.paxsite.com

04.23-24.16

Eagle LAN
Fort Meyers, FL
www.eaglelan.com

04.29-05.01.16

JGL Spring LAN
Jackson, TN
www.lanreg.org/jgl/springlan2016

04.30-05.01.16

Parlor City
LAN 4.0
Bluffton, IN
www.parlorcitylan.org

05.06-08.16

Dreamhack Austin
Austin, TX
dreamhackaustin.com

05.14.16

BearTrap Gaming LAN
Orem, UT
www.beartrapgaming.com

05.20-22.16

San Diego LANathon
San Diego, CA
www.Sandiegolan.net/lanathon

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Q&A With Saeed Arash Far

Patriot's Global Director of Engineering On Viper Gaming Peripherals

Q: For starters, what can you tell us about Patriot's Viper brand in general? How did it get started, and what sets Viper products apart?

SAF: Patriot started the Viper brand back in 2004 with our high-performance Viper Series memory. The Viper line has since become one of our most well-known product lines in the computer memory market and consists of our high-precision and engineered DRAM products. Patriot's goal is to produce high-performance, quality products at an affordable price for our customers, and that's what we want to come to mind when someone thinks of Patriot and the Viper brand.

Q: Last year, Patriot added several gaming peripherals to the Viper lineup. How did the company decide to get into the peripheral market, and what were your goals in designing these products?

SAF: Yes, we added the V760 RGB mechanical keyboard, the V560 RGB laser mouse, and the V360 7.1 virtual surround sound headset to our lineup. When we made the decision to expand the Viper line, we wanted to support the gaming community with the same dedication and quality we already have in our storage and memory solutions. For us, it appeared to be the most organic step in Patriot's progression and our Viper line to engineer a high-quality line of HID (human interface device) peripherals.

As a result of countless hours of development, we produced some of the most customizable HID solutions on the market, built with quality materials and the options that consumers look for when wanting to update and upgrade. We also made sure to offer the Viper gaming products at an



affordable price to continue with our core messaging and to set Viper products apart from the rest of the market.

Though we are new to the gaming peripheral segment, we have more than 31 years of experience in the computer hardware industry. We leveraged all of that expertise and know-how and consulted with our target demographic to ensure our first series of gaming peripherals would have the same level of success as our storage and DRAM solutions. A lot of careful consideration, late nights, coffee, and pizza deliveries were involved in developing and perfecting this product line. We knew Patriot needed to create something that was appealing in both function and aesthetics, and I think that's something we accomplished here.

Q: Let's talk a little bit about the Viper V760 Gaming Keyboard. How would you rank the importance of the following features, and why? Mechanical keyswitches, RGB LED lighting, macro support, and magnetic palm rest.

SAF: Wow, tough one, but here's an analogy for you: When you buy a car, you don't look at the options menu to see if the car comes with four wheels and windows that roll down, you simply assume that the car has those (options) by default. So, to rank features that are in a way expected to be present in a product of this caliber would be a bit hard.

If I have to rank them, I would put them in this order: mechanical keys, macro buttons, RGB LED lighting, consistency and management, and finally, a comfortable removable (magnetic) palm rest. For any professional or casual gamer, the functionality of the keyboard trumps aesthetics.

Consistent click feel and switch weight on mechanical switches are a must. Numerous research data points on mechanical switches vs. membrane on how they operate and provide feedback to a gamer gave us all that we needed to decide which direction we would move in. The gamers want mechanical switches that have a tactile feedback yet are quiet with a consistent feel when the keys are actuated. (This is how we chose mechanical brown switches over other options.) Mechanical switches also have superior performance when it comes to durability vs. traditional membrane keys; this guarantees the keyboard to outlast all traditional membrane keyboards.

103 macro keys allow for customization no matter what games are being played. Not every gamer has the same style, setup, or even macro layout, so the Viper V760 allows users to program up to five different profiles to support their favorite games.

When it comes to RGB lighting, the visibility of the light and the uniformity of the colors are of the most importance. You want all 104 keys on the keyboard to project the same color blue or green or any other

color from the possible 16.8 million choices that it can be set to. When it comes to light effects, high-quality LEDs are important to avoid flickers and choppy animation.

With the removable magnetic palm rest, it came down to functionality, comfort, and ease of portability. The Viper V760 magnetic palm rest is designed to securely attach to the keyboard and be comfortable when playing hours of games, yet removable when transporting the keyboard from one LAN party to another.

Q: What inspired the interchangeable side grips the V560 gaming mouse? We've seen some of its features before, but interchangeable grips are a new one.



Viper V360



Viper V560



Viper V760

SAF: Selecting a mouse can be a very personal experience for a gamer. Interchangeable side grips have a profound effect on the way the mouse feels when it is held and operated. We wanted to make sure we could accommodate different hand sizes and provide a solution that would feel comfortable for hours of game play, everyday use, or office work.

Q: The V560 is selectable up to 8,200dpi out of the box, but when users download and install the software, they can adjust it up to 12,000dpi. Why the difference, and what kinds of gaming scenarios benefit from 12,000dpi?

SAF: The laser sensor built in to the V560 has always been capable of performing at 12,000dpi.

We've been working in the background to perfect the way this translation takes place between the mouse movement on the desk surface and the mouse cursor movements on the computer screen. In many cases, we have found most gamers to be gaming comfortably at 4,500dpi. The additional DPI settings are aimed at users that desire quicker cursor movements on the screen.

Q: Shifting gears now to the V360 7.1 virtual surround sound headset: Why did you put the controls on the left ear cup instead of the cord?

SAF: Simple, by removing the controls from the headset cord

and integrating them directly into the ear cup, we removed the weight of the control mechanism from the cord, which makes for a much more comfortable feel when playing games or listening to music for several consecutive hours. Additionally, not having the controls on the cord prevents the control module from accidentally getting caught against other objects and causing damage to the cord and the headset.

Q: We can get behind a headset with an Ultra Bass Response feature, but why would anyone ever turn it off?

SAF: Good question. Experimentation and curiosity perhaps? With the UBR feature activated, the user is submerged in the game even more. With explosions going off, rapid fire, or even a

fighter jet flying overhead, the Ultra Bass Response enables the user to feel as if they are living the game and not just playing it.

Q: For most of its history, Patriot has focused on memory and memory-based products like SSDs and flash drives, so peripherals seem like a pretty big departure. What kinds of internal adjustments did designing, manufacturing, and marketing gaming peripherals require?

SAF: As with any new project and product, it required many long meetings to analyze research, discuss consumer behavior, and determine how the product will be received. The important

thing is to always remember that the work is never finished. The way we interact with everyday items can always be improved to create an easier and better overall experience. The recent improvements we've implemented on the Viper V560 mouse software are a testament to that idea. We are always looking to further improve our products and welcome all feedback.

Q: Can we expect more peripherals from Patriot in 2016? What about other new lines of products?

SAF: New peripherals are already in the works! Specifications are currently being defined, and we should have a full picture very soon. We are working on a new keyboard, headset, and mouse and hope to release further information by June. ■

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